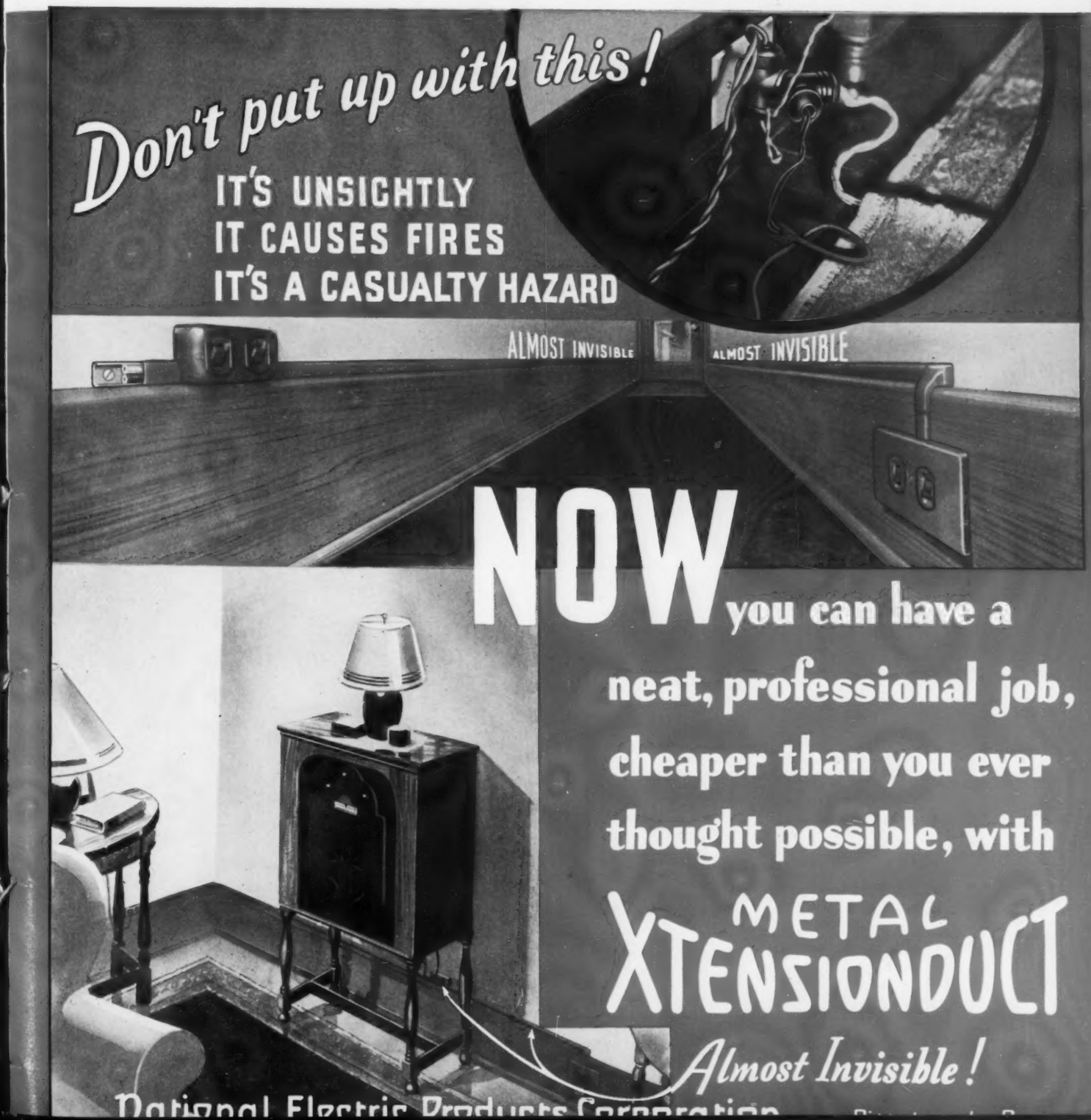
ELECTRICAL WEST

WITH WHICH IS CONSOLIDATED
THE JOURNAL OF ELECTRICITY

McGraw-Hill Co. of Calif. DECEMBER 1, 1932 Twenty-five Cents per Copy



Dnieper River at flood stage

•

500,000 second feet passing over the 2000 foot spillway

Dnieprostroy Dam — Power house in left background.

World's largest Hydro-electric plant.

Nine Newport News turbines rated at over 750,000 horsepower installed here.

NEWPORT NEWS SHIPBUILDING AND DRY DOCK COMPANY

90 BROAD STREET, NEW YORK, N. Y. NEWPORT NEWS, VIRGINIA

ELECTRICAL WEST, entered as second class matter at the post office at San Francisco, under the Act of Congress, March 3, 1879. Published at 883 Mission Street, San Francisco, California, thirteen times a year as follows: January 1, February 1, March 1, April 1, May 1, May 15, June 1, July 1, August 1, September 1, October 1, November 1, and December 1.

ELECTRICAL WEST

With which are consolidated the "Electrical Journal," the "Journal of Electricity, Power & Gas," and the "Journal of Electricity"

Established 1887

McGraw-Hill Company of California

G. C. TENNEY, *Editor*

C. W. LEIHY, *Associate Editor* — W. A. CYR, *Associate Editor* — R. H. FLYNN, *Assistant Editor*

Volume 69 — San Francisco, December 1, 1932 — Number 6

McGraw-Hill Company of California

883 Mission Street
SAN FRANCISCO

SOUTHWEST OFFICE
340 Chamber of Commerce Bldg.
LOS ANGELES, CALIF.

Publishers of

ELECTRICAL WEST

JAMES H. MCGRAW, *Chairman of the Board*
EDGAR KOBAK, *President*
NATHAN A. BOWERS, *Vice-President and General Manager*
GEORGE C. TENNEY, *Vice-President*
HOWARD C. WORDEN, *Secretary and Treasurer*

NEW YORK, 330 West 42nd Street
CHICAGO, 520 North Michigan Avenue
WASHINGTON, National Press Building
PHILADELPHIA, Commercial Trust Bldg.
BOSTON, 1427 Statler Building
CLEVELAND, 501 Guardian Building
ST. LOUIS, 1555 Bell Telephone Building
DETROIT, 2-257 General Motors Building
GREENVILLE, S. C., 1303 Woodside Bldg.

Subscription rate in the United States and possessions, $2 per year, two years $3; Canada, $2.50 per year, two years $4; all other countries, $3 gold (13 shillings), two years, $5. Single copy, 25 cents. When change of address is required, both old and new addresses must be given. Notice must be received two weeks before change takes place.

Member Audit Bureau of Circulations

Associated Business Papers, Inc.

Copyright 1932 by

McGraw-Hill Company of California

Contents

Editorial 219

The Industry—

Just Plain Common Sense 222
By HARRY J. BAUER *and* GEORGE C. WARD

Construction—

Three-Phase, Four-Wire Costs Analyzed 224
By R. E. LLOYD

Engineering—

Supervisory Control for 220-Kv. Station 228
Problems and Economies of Rebuilt Oil Switches 231
By R. E. ROWLEY, JR.

Commercial—

First Five Hundred Are the Hardest 234
Do You Build Salesmen—Or Bully Them? 235
Stage Flexibility Applied to Windows 236
Remarkable Results From New-Type Chick Brooders 238
By J. C. SCOTT
Sterilization of Soils Electrically Is Sure 239

Motor Forum—

Concluding Specifically 240
By FRANK E. BOYD

Miscellaneous 242

News 244
P.C.E.A. 247
Northwest Association 251
Personals 252
Contractor, Dealer, Inspector 253
Manufacturer, Distributor 254
Market Review 255
Barometer 256
New Products 257

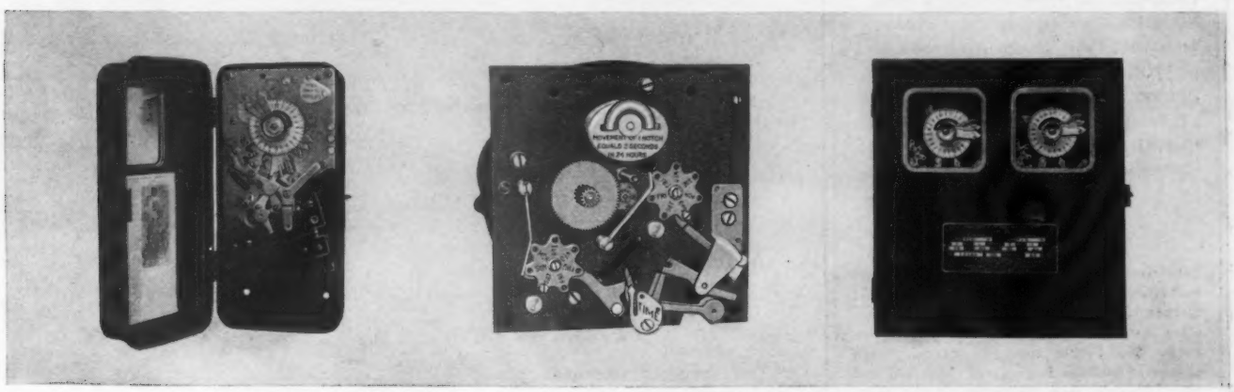
Form VW and VS—VW (electrically-wound) and VS (synchronous motor) switches, moderately priced, dependable. Any commercial frequency. Sunday and holiday cut-out. Manual operation without disturbing sequence.

NOW...

Precision engineering... fine workmanship ...and low prices. These you have a right to demand in time-switches today. You will find them... as so many others have already done... in Sangamo's complete line of time-switches.

A few representative members of the Sangamo time-switch family are shown on these pages. Type TC... wound electrically and controlled by an eleven-jeweled Hamilton escapement. The moderately priced, electrically-wound VW. The VS synchronous motor-switch. And other items that are winning favor everywhere.

All Sangamo time-switches are guaranteed by Sangamo, leading manufacturer of high-grade electrical equipment for thirty years. Sangamo engineers are constantly studying time-switch requirements in order to meet every possible need. Write for literature.



Form VW-22

The VS or VW single-pole, double-pole or triple-pole, *double-throw* time-switches meet all requirements for single or dual thermostatic controls, auxiliary relays or special watthour meter connections.

Type TCHE

The advanced time cut-off, with omitting device, permits wide variations in daily, single-circuit control. Operations any day can be omitted entirely, or "off" operations can be advanced from regular time on any days desired.

Duplex

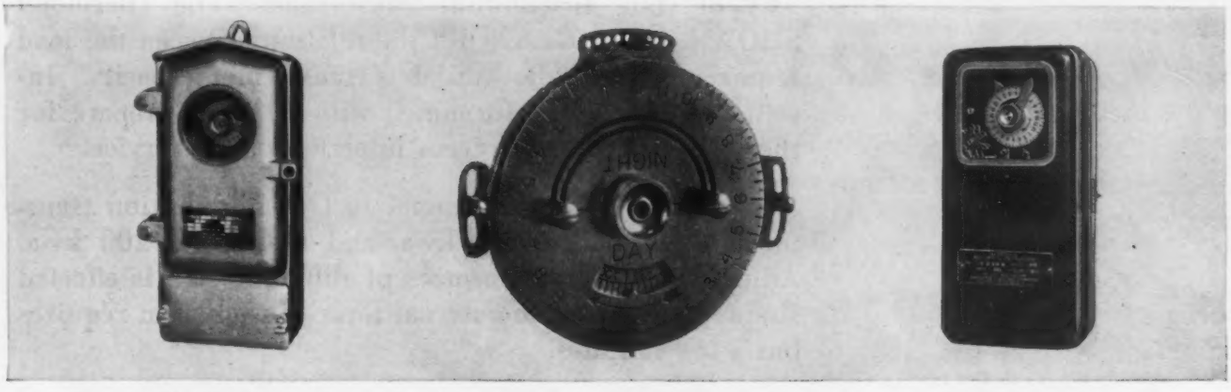
Duplex time-switches... independently controlling two separate circuits. Admirably suited for control of apartment house lighting, Neon and flood lighting, poultry house lighting, or any a.c. two-circuit combination.

SANGAMO ELECTRIC COMPANY • SPRINGFIELD, ILLINOIS

A Complete Line of SANGAMO TIME SWITCHES

$24.00 AND UP... RETAIL

Type TC—Where only the very best switch is good enough . . . this type is recommended. Electrically-wound . . . 11-jeweled Hamilton escapement. Independent of frequency and voltage variations. Conduit-connected base.



Outdoor

A rugged cast-iron, outdoor, weatherproof case, cadmium plated, aluminum painted, with sponge rubber housing gasket, supplied with VSO time-switch. Same case can also be provided for form VWO and TCO when required.

Astronomical Dial

For form VS or type T. Made for different latitudes for any city in the United States. Operating levers follow sunset and sunrise curves. An auxiliary lever provides a means of cut-off between 11 p. m. and 1 a. m. when required.

Defroster

The Sangamo Defroster, with self-starting synchronous motor, automatically defrosts any electrically-operated refrigerator at any hour of any day selected. Recommended by leading refrigerator engineers everywhere.

SANGAMO ELECTRIC COMPANY • SPRINGFIELD, ILLINOIS

(Right) Cat. No. 8K1A1, pole type, with overload signal tripped. (Below) Cat. No. 8K2A1, for subway and large distribution transformers, showing partial load registration

Do you KNOW the margin of available capacity?

WHY not be certain of the efficiency of application of your distribution transformers? The Thermotel SHOWS AT A GLANCE* the relation between the load requirement and the available transformer capacity. Installed on each transformer, it will help you prepare for the winter peak and prevent interruptions to service.

You can apply the Thermotel to G-E distribution transformers as small as 1½ kv-a. and as large as 200 kv-a. Adjustment for transformers of different size is effected simply by shifting an external lever. Installation requires but a few minutes.

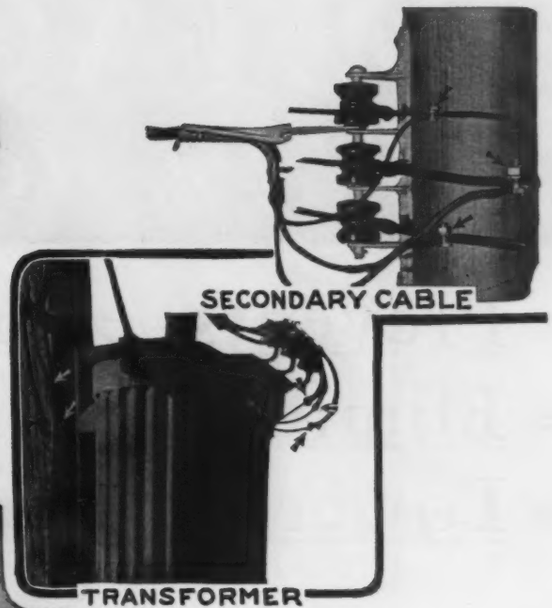
Thermotels are more fully described in Bulletin GEA-309C. They are available for immediate shipment from our district warehouses. Order through G-E sales offices.

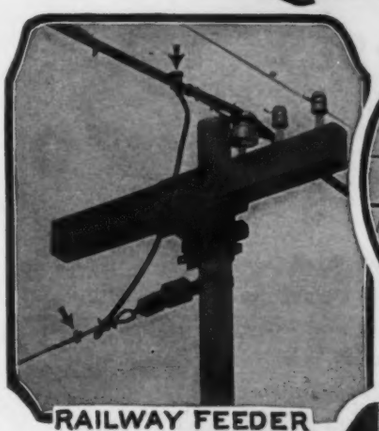
*The Thermotel indicates directly the per cent of available transformer capacity actually being used. This is possible because the Thermotel automatically corrects for ambient temperature.

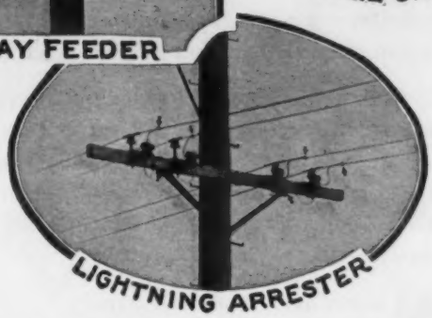
405-33

GENERAL ELECTRIC

5 COMMON USES







IF you are making electrical connections of any kind then there is a Kearney Connector which will make it better and cheaper. They are made in a complete range of sizes and types which will meet nearly every phase of electrical construction requirements.

That Kearney Connectors are the modern way of making electrical connections is testified to by the enormous increase in their use. An unquestionable recommendation is the fact that they are being used at the rate of nearly ½ million a month.

For further information on Kearney Solderless Connectors write for Bulletin 310.

Other Kearney Products: Solderless Connectors; Double Duty Cutouts; Rural Fuse Switches; Disconnect Switches; Standard Fuse Switches; Fuse Pullers; Plug Cutouts; Guy Wire Clips and Strand Bands; Sleeve Twisters; Live Line Tap-Off Clamps; Live Line Tools and Accessories; Economy Cable Clamps; Grounding Sets; Underground Boxes; Pole Top Gang Operating Switches; Quick-Break Gang Operating Switches; Lox-Round Guy Guards; Hitemeters; Fuse Link Boxes; Cable Ring Saddles; Duct Rods; Fuse Links; Dead-End Service Cable Clamps; Screw and Expansion Anchors.

JAMES R. KEARNEY CORP.
4224-42 CLAYTON AVENUE • ST. LOUIS, MO.
Factories: **St. Louis, Mo. • • Taylorville, Ill. • • Toronto, Canada**

SOLDERLESS WIRE CONNECTORS

MAYDWELL & HARTZELL, INC.

158 11th Street, San Francisco • • 455 Colyton Street, Los Angeles
CALIFORNIA

THE NEW TYPE OC DETACHABLE *in this new metering*

- Prevents energy diversion
- Eliminates missed readings
- Lowers metering costs

ECONOMIES and advantages never before attained in the metering art are assured by the New Metering System, developed by Westinghouse . . . which consists of the OC Detachable Meter, the Nofuze Load Center, and the New Portable Stroboscopic Meter Standard.

As part of this system, the OC Detachable Meter in itself assures the following specific advantages:

1 *Quick, easy, low-cost installation and removal.* The OC Detachable Meter plugs in and pulls out readily like a radio tube—*and requires no expensive meter box.*

Mounting this new meter on the outside of a house, exactly opposite a Nofuze Load Center installed in the kitchen wall, makes a very adequate wiring job—eliminating long runs of heavy wire.

The OC detachable meter can be installed at less cost than any other form of metering—either indoor or outdoor.

2 *Elimination of energy diversion.* By mounting the new OC Detachable Meter on the outside of the house, in full view of the public, ahead of any fuses, and with conduit connections, the possibility of energy diversion is practically eliminated.

3 *Accessible for reading at all times.* Mounted outdoors, the OC Detachable Meter saves the expense of return trips for missed meter readings—trips that disrupt the continuity of monthly readings and revenue income. This feature is of special value along rural lines.

4 *Economical and safe testing.* For testing OC Detachable Meters, a small, easily-carried test jack eliminates the cost of permanently installed test facilities. Also, this jack makes "dead front" testing a certainty—guarding the meter tester, meter, and transformer against the danger of short circuits.

And with the new Portable Stroboscopic Meter Standard, meter testing and calibration in the field become as simple as setting a timepiece. "Cut-and-try" methods—tedious calibrations—stop watches—starting and stopping devices—human errors—are eliminated.

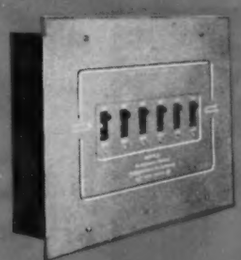
5 *Initial and Sustained accuracy.* Initially, and after years of service, the OC Detachable Meter will register fully the smallest load, such as an electric clock, without neglecting in the slightest degree the heavy loads of late afternoon and evening.

Its registering element is protected by a weatherproof case that is impervious to all the damaging agents of year-round outdoor service. The hottest days of summer or the coldest of winter—even the searching dust and grit of windstorms—cause practically no change in the finely attuned mechanism within the cadmium-plated case.

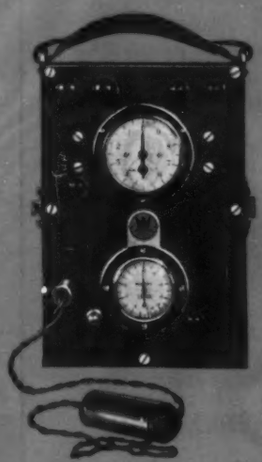
For complete information about the advantages of the New Metering System, simply mail the coupon.

METER *system*

New OC Detachable Watthour Meter



Nofuze Load Center



New Portable Stroboscopic Meter Standard

Westinghouse

T 79389

Quality workmanship guarantees every Westinghouse product

SEND FOR BOOKLET

Westinghouse Electric & Manufacturing Company
Room 2-N—East Pittsburgh, Pa.
Gentlemen: Please send me C. 1960, A New Metering System.

Name .....
Company .....
Address .....
City ..... *State*..... EW 12-32

Why

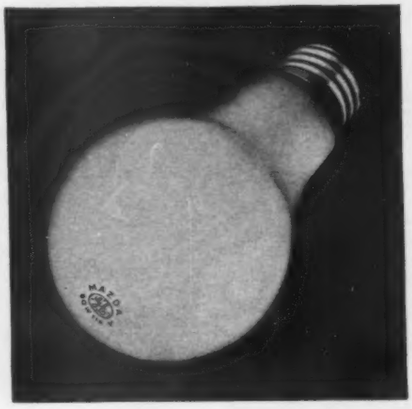
More than ever

People Want GOOD LAMPS

People have always wanted good lamps.

But now the insistence on quality is stronger than ever . . . Why?

Because the fact that good lamps give more light for the current they consume is being driven home to the American public more forcefully than ever before . . . and from every angle.



Editorially! Through the columns of the leading popular magazines, business papers and business magazines, skilled writers are convincingly telling every user of lamps *why* good lamps give good light at low cost.

By Advertising! General Electric advertising . . . blanketing the country, reaching into practically every home, every factory, every store in the land, further emphasizes this idea.

By radio! Each week General Electric's radio program carries the same message to millions of listeners.

Your customers are interested in this campaign because it is in their interest. And you can make this campaign local by using the display material furnished from Nela Park. General Electric Company, Nela Park, Cleveland, Ohio.

GENERAL ELECTRIC

MAZDA LAMPS

ELECTRICAL WEST

With which is consolidated the Journal of Electricity
McGraw-Hill Company of California

San Francisco, Dec. 1, 1932
Volume 69
Number 6
G. C. TENNEY, *Editor*

Come Back—All Is Forgiven

BUSINESS affairs are not much different from domestic affairs, after all. Human beings have a way of acting in just about the same manner under stress, whether that stress is the family budget or the company budget. After just so long, something has to let go.

At the family fireside it may be dishes, or going home to mother. In business it is "ethics be damned, we've got to get some business. Meet all competition." Both are a sort of emotional blow-off based on desperation. In election years this feeling manifests itself as a new deal, a change. In foreign lands it is a revolution.

Yet, after all, a grand outburst can't last for ever. Prices cannot continue to slide and slither downward. There is a limit to the amount of money that can be thrown madly into the competitive fire, just as there is to the number of dishes in the cupboard. In the end, sobered and contrite, all parties must seek forgiveness and a new start—whether to replenish the dish cupboard or the business bank account.

A recitation of some of the suicidal trade practices to get a share of business that have been indulged in during the past months would sound like a nightmare. One man, whose record of business conduct has been an inspiration to the electrical trades, expressed himself to this effect, "If anyone had told me two years ago that I would sink so low as to do the things I have done in the competitive battle for some business in the past few weeks, I would have knocked his teeth out."

Obviously such a condition cannot continue. It leads desperately into one of those frontier day gun duels, in which two enemies of long standing, failing at sniping, grasped each other by the arm, and knifed each other to death. And like such a duel, the remote cause, magnified with each new incident, was some trivial misunderstanding.

Editorial

"Come back, all is forgiven!" Let the slate be wiped clean. Let buying and selling bygones be bygones. Everyone has just been human, has unloaded his anxiety and distress in his commercial practices. No one is whiter than anyone else. There is nothing to be gained, and everything to lose, in keeping up the price brawl. A new start, a clean start, is the only way up and out.

Let us have a new deal in the electrical business, too.

Edison-Power Bureau Agreement Benefits the Public Most

DIFFERENCES which for many years have been a source of discord and litigation have been settled amicably by the Los Angeles Bureau of Power and Light and the Southern California Edison Co. Ltd. Substituting cooperation for controversy, an agreement has been reached which unquestionably will redound to the benefit of both organizations and to the people of southern California.

Harry J. Bauer, new Edison board chairman, commenting upon the contract, has enunciated a policy of public service which utilities everywhere might well heed. He says:

> This agreement is, in my opinion, a common-sense, businesslike settlement in the community interest of a community problem. The Edison company's actions in these negotiations have been prompted by an earnest desire to effect definite economies to all users of electrical energy in southern California. We hope and believe that an equitable settlement of a number of controversial points at issue will serve this purpose.
>
> Through this agreement, cooperative use of existing steam generating equipment and of Hoover Dam trans-

mission lines will be assured at a saving of expense to both the bureau and the company. Both the bureau and the company are community institutions dedicated to the public service, and in the operation of which the community as a whole has a substantial interest. Duplication of investment in the field of electrical service is and always has been uneconomical. The added expense caused by duplication necessarily must be reflected in the cost of service to the consumer.

In the final analysis, there should be no conflict between government and the utilities. Each is dedicated to the common service of a common group—the public. How much better for utilities, government and public alike is the calm and dispassionate consideration of problems which seem perplexing and complicated. The example set by the Edison company and the Power Bureau is a hopeful sign for the future.

AN electric bridge table that shuffles and distributes the hands is the latest addition to the labor-saving devices for the tired businessman whose wife takes him out evenings. If the inventors had only gone a step further and made the machine bid and play the hands for us, it might have been of some real use. One thing it has done though. You can now blame the power company for poor hands.

Lighting Schools Spotlight Commercial Value of Light

ONE of the most beneficial aspects of the recent lighting schools held in San Francisco and Los Angeles under the auspices of the Pacific Coast Electrical Association, was the attention they directed back to the electrical industry's initial function, that of providing light for the world. Like anything else that usage has made familiar, lighting has come to be taken so much for granted that it needed just this emphasis to bring it back into active consciousness as a dominant part of electrical service and commercial opportunity.

Particularly significant were the new trends pointed to in the lectures on modern lighting developments. The integral use of luminous elements in architectural design, the explorations into the uses of invisible light—the ultra-violet and the infra-red—,the progress in luminous gas tube development, the new intensity levels for all applications, the more positive field testing photometers, and the more intelligent use of color in lighting, all point to a progressive era of lighting usefulness and profit. A future for lighting was pictured that makes the past twenty years puny by comparison.

Lighting may well continue to lead the way for the electrical industry in its advancement for, like every other market for electrical service, it possesses limitless opportunities.

NORTH Hollywood girls of the Southern California Edison Company Ltd., have begun to study languages in order to converse in the tongue of foreign-speaking customers, a courteous and thoughtful gesture, indeed. It should be particularly useful in explaining the service to the annual importation of Garbo and Dietrich successors.

An Opportunity for A Research Investment

WHEN ELECTRICAL WEST a year ago suggested the establishment of an electrical utilization research foundation on the Pacific Coast, leading educators strongly urged that existing facilities, equipment and manpower of the various universities be utilized to the utmost. Expressions of willingness and desire to assist in such an undertaking were almost universal.

Now comes an opportunity to test the practicability of the program which was suggested at that time. On Nov. 17 the San Francisco Section of the A.I.E.E. were guests of the University of California departments of physics and chemistry at a demonstration of the research work being conducted under the direction of Prof. E. O. Lawrence. By using moderately high electromagnetic fields, Dr. Lawrence and his assistants are experimenting with the disintegration of atoms and producing results with voltage equivalents of magnitudes far in excess of anything heretofore practical with equipment at the command of researcher or engineer. First practical result has been the perfection of a 1,000,000-volt X-ray tube with immense possibilities both for useful work and further research. Professor Lawrence briefly sketched for the Institute other practical values to the electrical industry which may come from these experiments.

Much of the equipment employed and considerable money for work on these experiments have been donated by manufacturers and a national research foundation. However, ELECTRICAL

WEST has been advised by Professor Lawrence and the university authorities that continuation of the work is seriously jeopardized by lack of funds. Such a possibility is unwarranted, particularly when the experiments portend future results of actual benefit and profit to the electrical industry.

In the light of its previous recommendations, ELECTRICAL WEST urges that the electric light and power companies step into the breach and supply the present deficiency. A check on past experience with institutions of higher education on the Pacific Coast reveals that in every instance, from the Ryan high-voltage laboratory at Stanford to the work of the committees on the relation of electricity to agriculture, the power companies have benefited from experiments which they have helped to finance.

PUBLIC Service Company of Colorado's vice-president and commercial manager has given the electrical industry a slogan. In a recent address, he said, "We cannot economize our way out of our present situation. We must SELL our way out."

Christmas Needs Cheer of Decorative Lighting

OTHER years have known gorgeous Christmas seasons, when the plenty of the land found itself distributed to the darkest corners and a blaze of glory signified the cheer that pervaded the world. The year 1932, stern, barren, ruthless year that it has been, gives little incentive to the celebration of the gorgeous Christmas of yesteryears. But it does enjoin us all to make a brave Christmas of what we have.

Will there be organized drives for outdoor Christmas lighting? There ought to be. The industry is familiar with the methods by which such community-wide events can be set in motion and carried through. It will take enthusiasm and a cheery view on life to coax, persuade and inspire participation by the community. Yet there will always be a number of folks ready to do their part and set an example for their fellows to follow.

Will the electrical stores sparkle with new wares and simple, yet appropriate, decoration? Certainly and universally. Will there be new devices and models on display? No electrical merchant worthy of the name will overlook this opportunity. Hard year to the contrary, there will be much gift money spent this season just the same. With every type of merchant competing for it, the imagination must be keener, the display and selling more ingenious, but the electrical share of the Christmas dollar is worth a magnificent effort. It means so much employment in the electrical manufacturing and selling as well as in final use of energy. This in itself means a bigger Christmas for more people, and so the progression grows.

Other years have had more gorgeous holiday seasons, but none of them can be any more fun than this one, can be any happier or more truly profitable in some of the things that are priceless —good cheer and a faith in better days to come.

BUYING, like charity and many other things, begins at home. A policy adopted by a number of utility companies in the Mountain states will be good for its own customers. In effect, it is that equipment and merchandise will not be purchased from manufacturers or wholesalers who maintain no stock, headquarters or representatives in the territory. Moreover, this policy stops the dumping of distress merchandise into that market to demoralize the trade and render no permanent service to the community.

$600 Millions for Western Prosperity

BEFORE the first quarter of 1933 ushers in a new spring, construction projects totaling more than $600 millions will be actively under way in the Pacific States. Elsewhere in this issue is a summary of major jobs of interest to the electrical industry. Just what proportion of the vast sum will be spent for electrical equipment and supplies is problematical, but the total will run into eight figures. However, that is only half of the story. This money will be put into circulation. It means jobs. It means more electrical energy used. It means more washing machines, ranges, refrigerators and other appliances sold. The work reported by the industrial modernization and rehabilitation committees can be translated definitely into terms of electrical equipment and material. The outlook should mean optimism and enthusiasm, for if it is true that prosperity is just around the corner, as we have been lead to believe, then we can see the corner and a small shadow of the real thing.

Just Plain Common Sense

A Liberal Application of That Should Determine the Public Policy of a Utility, Writes Harry J. Bauer, Chairman of the Board, Southern California Edison Co. Ltd., in the First Delineation of His Administrative Beliefs

THE EDITOR has asked me to state my idea of a progressive public policy for an electric utility. The term "progressive" has a variety of definitions, one of which makes it a synonym for "radical," but I prefer the definition which makes it more synonymous with enlightened common sense. My ideas as to a public policy for an electric utility are neither new nor radical, but I hope they may be found to be based on the common-sense view of the relations between the utility and the public, and therefore to be in accord with the teachings of experience.

It is my belief that the public policy of utilities should be determined by the application of just plain common sense to the outstanding physical facts surrounding the utility business. When we look at these outstanding physical facts, we find among them the following:

The utility must make a long-time fixed investment. This means that the investors who choose to employ their capital in the utility field must have confidence that the earnings of the utility will be sufficient to meet its obligations over a long period of years. The turnover of the capital invested is very slow. This investment is interwoven into the community in such fashion that there is complete interdependence between the success of the utility and that of the community. Since the invested capital of necessity is dedicated to the service of the community in which it is first placed and is of little value unless it can be utilized in that community, it follows that the retention of the patronage of the community is essential to the preservation of the investment. It also follows that retention of the confidence and good will of that community in both the near and the distant future must be the constant aim of the utility management.

The utility policy must be based on the long view. It cannot follow successfully a policy which might serve the purpose of the business which sells something today and moves on tomorrow. The utility must continue to do business "at the same old stand" year in and year out.

Utility managers are trustees of the interests of both consumers and investors. The neglect of the interests of one group will react adversely upon the interests of the other. Bad business management of the utility, inequitable rate schedules or poor service tend to destroy the demand for the services or products of the utility. Unfair treatment of the utility, whether through vicious and unjust criticism, unfair taxation, political harassment or other unjustified attacks tend to destroy the morale of both the utility employees and investors, leading to withdrawal of the investors' funds and, hence, to the jeopardizing of the utility's service upon which the community is dependent.

From the foregoing facts, which probably will not be disputed by any fair-minded person, the following cardinal points in the public policy of an electric utility management naturally and inevitably flow: The utility management should have as much concern for the fair and generous treatment of the utility's consumers as of the utility's stockholders. The utility should assist in the development of a sound and well-balanced community, and to this end its personnel should cooperate in the carrying of community burdens and the solution of community problems.

The facts as to the costs and earnings of utility service should be made available to the public at frequent intervals, because common-sense tells us that the best preventive of misinformation is the ready availability of correct information. While suspicion and distrust quickly undermine good-will and confidence, these destructive forces, which flourish only in the dark, lose their strength when the field of activity of the utility is flooded with light.

For almost three decades the Southern California Edison Company has had as the guiding principle of its public policy the motto advanced in 1905 by its late chairman, John B. Miller,—"good service, square dealing and courteous treatment." In that motto there are included the essential elements of a common-sense affirmative public utility policy.

Now, when the managers of a utility are faithfully carrying out such a policy, when they are providing an essential service at prices determined by the reasonable costs of labor and of capital prudently invested and wisely directed, and when they are bearing their share of community burdens and honestly cooperating in the advancement of the public interest, they have the right to ask from the public and representatives of the public the same fair treatment and square dealing which they are giving to the public. This treatment every right-minded utility manager and employee asks and expects not so much for himself as an individual

as for the customers and investors whose interests it is his duty to protect.

There are those in every community who think it profitable, for one reason or another, to attempt to destroy public confidence in and good-will toward the utility. This confidence and good-will is the utility's most valuable asset,—the very foundation-stone of its usefulness. Once lost, it is more difficult to replace than are physical assets. If this be true, then common-sense tells us that, if we are to perform our full duty as utility managers, we must be alert to detect and to combat unfair and unscrupulous attacks directed against our company's most valuable asset.

The policy of adequate publicity, as to rates, costs and earnings hereinbefore referred to, is the first line of defense. If that proves insufficient, we should not be "too proud to fight," and since we are protecting the interests of consumers and investors, we have the right to present the facts to them, openly, through all legitimate channels, and ask their assistance in the common cause of protecting their service. If we are prepared with the facts, if we know we are fighting to defend the real public interest, we must not be deterred by the false cries of "propaganda by special interests." We cannot expect someone else to fight our battles for us. The public at large has its own problems and will take an interest in ours only if we insistently ask for a fair hearing. And we should present our appeals for public support not on the false ground of altruism, but frankly on the basis of enlightened self-interest in the promotion of our public service.

Having obtained such a hearing, we can only rely upon the good judgment of the majority for recognition of our rights, which, if our policies are sound, are also the public rights.

Eternal vigilance is indeed the price of liberty, and it is also the price which is exacted of public utility management. It is my belief that if we are eternally vigilant and diligent in the pursuit of the policies which I have herein briefly and inadequately outlined, the public will accord us such fair treatment as, thus, we shall have earned.

George C. Ward, President of the Edison Company, Sees No Competition for the Quality of Electric Service, But Believes Sales Departments Will Have Plenty to Do in the Upswing

FOR THE next few years, public utility management will have to steer its course with more than ordinary caution. Great influences are at work in the world and their ultimate effect cannot yet be measured. Not all of these influences are new, but there are more of them, both new and old, in evidence simultaneously than ever before.

During the years of its rapid expansion, the electrical industry had problems quite different from those which now face it. Not the least of today's problems is that of making enough money to maintain securities in a sound position while operating on rate schedules which enable it to meet the incessant competition of other agencies. It is my belief that our electric utilities will be able to solve these problems as they have surmounted equally difficult ones in the past.

In the case of the Southern California Edison Company, we are trying to improve the ratio between earnings and plant investment. Improvements in the standard of service and refinements in equipment have increased our unit costs year after year until they have reached a point which challenges attention. This is emphasized when we make comparisons between our service and that of some of the threatening competition. One thing is certain: At present, there is no competing medium which can approach the quality of service offered by a company such as ours. Our problem is to maintain this high quality and at the same time keep an eye on operating costs.

For the immediate present, we must look to the existing consumer for additional revenue rather than to new connections. While the Western movement has been retarded during this depression, we should not feel that our further increase in population is at an end. But when we consider the sources of our new population and observe the havoc that has been done by the depression, we realize that some time must elapse before those who have planned to come to California will have had time to adjust their affairs. In the meantime, we have built up a considerable backlog of latent business on our lines which will produce revenue as our own economic conditions improve.

In the past, an annual growth of about 10 per cent was a normal condition. As we have not made such a growth for two years, there is an accumulation of about 20 per cent lurking somewhere. Some of this will be immediately available as soon as there is a general assurance of business improvement; for the remainder we probably will have to wait. In addition to this there has been a falling off of regular business amounting to about 15 per cent, on the average. This will be recovered rapidly as conditions improve.

Sales departments will have plenty to do as we come out of the fog of the depression. The desire for new facilities and improved services has in no way been lessened because people were unable to buy; on the contrary, the desire for many of these things probably has been intensified. We can look forward to modernization of industrial plants where the importance of efficient operation is now being brought home. We can look forward to a big outlet for appliances, and especially electric ranges, in the domestic field. Lighting intensities will continue to rise in commercial applications.

There will be an inevitable revival of the oil industry; this may not be apparent now, but it cannot long be deferred. A nation-wide interest in air conditioning will bring this new outlet for electricity to the fore.

These are events which should happen in the normal fashion during the next few years. The fact that anyone questions their coming shows how greatly we have been influenced by changing economic conditions difficult to comprehend. The electrical industry is still a forward looking industry, and those of us who have spent our lives in this field are still looking ahead to the further extension of our business. As electricity becomes more and more a part of the world's every day affairs, it must be more responsive to social factors at work in the world. This is true of any industry, and the fact that business in the past has been able to meet these adjustments should relieve us from worry in this direction.

3-Phase, 4-Wire Costs Analyzed

By R. E. LLOYD
Engineer and Estimator
Los Angeles

Anyone With a Knowledge of Simple Arithmetic Can Derive From This Revealing Article the Facts and the Costs of Three-Phase, Four-Wire Circuiting, as Compared With Other Systems of Wiring. It is Rare That an Estimator Reveals His Cost Figures, but Only by Such Frankness Can the Real Data Be Known and the Electrical Art Improved. The Editors Consider This Article a Genuine Contribution to the Actual Facts as to the Much Disputed Costs of Wiring

THREE-PHASE, four-wire, 120/208-volt distribution circuits are coming into use gradually and surely. Many power companies are insisting upon these systems in new areas and are changing over old systems wherever that is feasible, because a 3-phase, 4-wire system makes possible a more nearly balanced load on all feeders and transformers, thereby raising the efficiency of the entire distribution system and providing a more uniform potential to the consumer.

After reading several technical articles written on the subject by capable engineers, and after talking to many inspectors, contractors and electricians, the author has become convinced that a practical study of the fundamentals of the system would be an aid to many who have not had the time or opportunity to search out such information for themselves.

Referring to the figures on the opposite page, assume that 2 per cent is the maximum allowable drop from panel to load center and that no conduit larger than 1 in. will be permitted in the floor slab. In Fig. 1, representing a 3-phase, 4-wire, 120/208-volt system with balanced load, the amperes per leg are

Symbols Used

Circ. mils	— Circular mils
A	— Amperes per leg
L	— Length of wire from panel to load center
W	— Total watts of a 2-, 3- or 4-wire circuit
VL	— Volts lost

$$A = \frac{W}{V\sqrt{3}} = \frac{4500}{208 \times 1.73} = 12.51$$

To determine the size of conductor to be used:

$$\frac{10.8 \times A \times L \times \sqrt{3}}{VL} = \frac{10.8 \times 12.5 \times 180 \times 1.73}{(2\% \text{ of } 208) \text{ or } 4.16} = 10{,}114 \text{ circ. mils}$$

Thus, each phase wire carries 12.51 amp., neutral carries nothing. When the load is not the same on the different phases, divide the watts on each phase by 120 to get the amperes per leg.

Suppose that there are local switches on each row of lights and, as it begins to grow dark, alternate rows are switched on, i. e., the rows marked (phase) A and C in the upper group and B in the lower group. The load no longer is balanced: one row of lights is operating on phase B on a 2-wire circuit (lower); in the upper group, phase B is out of the circuit, but A and C and neutral are not operating as a 3-wire, single-phase circuit. If they were, the voltage at each lamp would be 104 minus the line loss. Because of the transformer arrangement and the consequent phase relations, the neutral now is carrying 12.51 amp., the same as A and C, thus adding the line drop of the neutral to the drop calculated for a balanced load.

If this condition were to prevail for long periods of time and at peak load, it would indicate a serious loss of efficiency, but in most cases the time would be comparatively short and the condition would occur only when the main and sub feeders were partially loaded, thus compensating for some, if not all, of the extra drop.

Suppose one 1-in. conduit with seven No. 10 wires is substituted in place of the layout shown and that one neutral is used for all six circuits, as permitted by the National Code. Now it is possible to use either alternate rows or all of the lights, and in any case the phases are balanced and the neutral still carries nothing. Thus the standard of efficiency is maintained and, at the same time, the cost of installation is cut. The objection to this, when there are local switches, is that both groups on one phase might be switched on without the others; this would necessitate a larger neutral.

It is clear that, in any installation where the lighting can be controlled remotely in groups, it is possible easily to arrange a perfectly balanced load. In a large area where each lighting unit is equipped with a pull-switch, and especially where there are many small units on each circuit, the matter of balance may be ignored, regardless of whether a 3- or 4-wire system is used.

Thus far in this article the 110-volt, 2-wire circuit has been ignored because it presents such a sorry comparison to the more modern circuits. It will be included in the cost analysis mainly for the information of builders and architects who still specify 2-wire circuits under the illusion that there is little difference in cost.

In the cost comparisons following, suggested resale prices of a certain date have been used. No matter how these prices compare with those now current, the indicated price of material does not affect the percentage ratio of the different systems because they all are based upon the same price schedule. The apparent difference in the length of the various home runs, due to triangulation, is not nearly so great as it appears to be, because in all of the figures the feeders have been drawn to a much smaller scale than have the lighting groups. In figuring the lengths of wire needed, ample slack has been added for pulling, splicing, waste, etc.

Fig. 1—Boxes, conduit and fittings incidental to the wiring of the local lighting groups, but excluding wire and feeders

2 No. 52151 boxes	@	$20.00 per 100	$ 0.40
16 No. 54151 boxes	@	18.00 per 100	2.88
2 No. 52C3 covers	@	17.00 per 100	0.34
16 No. 54C3 covers	@	10.00 per 100	1.60
18 Fixture studs	@	10.00 per 100	1.80
160 ft. ½-in. conduit	@	11.00 per 100	17.60
32 ½-in. bushings	@	2.00 per 100	0.64
64 ½-in. locknuts	@	1.00 per 100	0.64
Common to all systems shown			$ 25.90

Feeder conduits and wire

320 ft. ¾-in. conduit	@	$13.00 per 100	$ 41.60
4 ¾-in. bushings	@	2.50 per 100	0.10
8 ¾-in. locknuts	@	1.50 per 100	0.12
1,490 ft. No. 10 r.c. wire	@	20.00 per 1,000	29.80
180 ft. No. 14 r.c. wire	@	10.00 per 1,000	1.80
			$ 73.42
Total for Fig. 1			$ 99.32

Fig. 2—Boxes, etc., as in Fig. 1 $ 25.90

Feeder conduits and wire

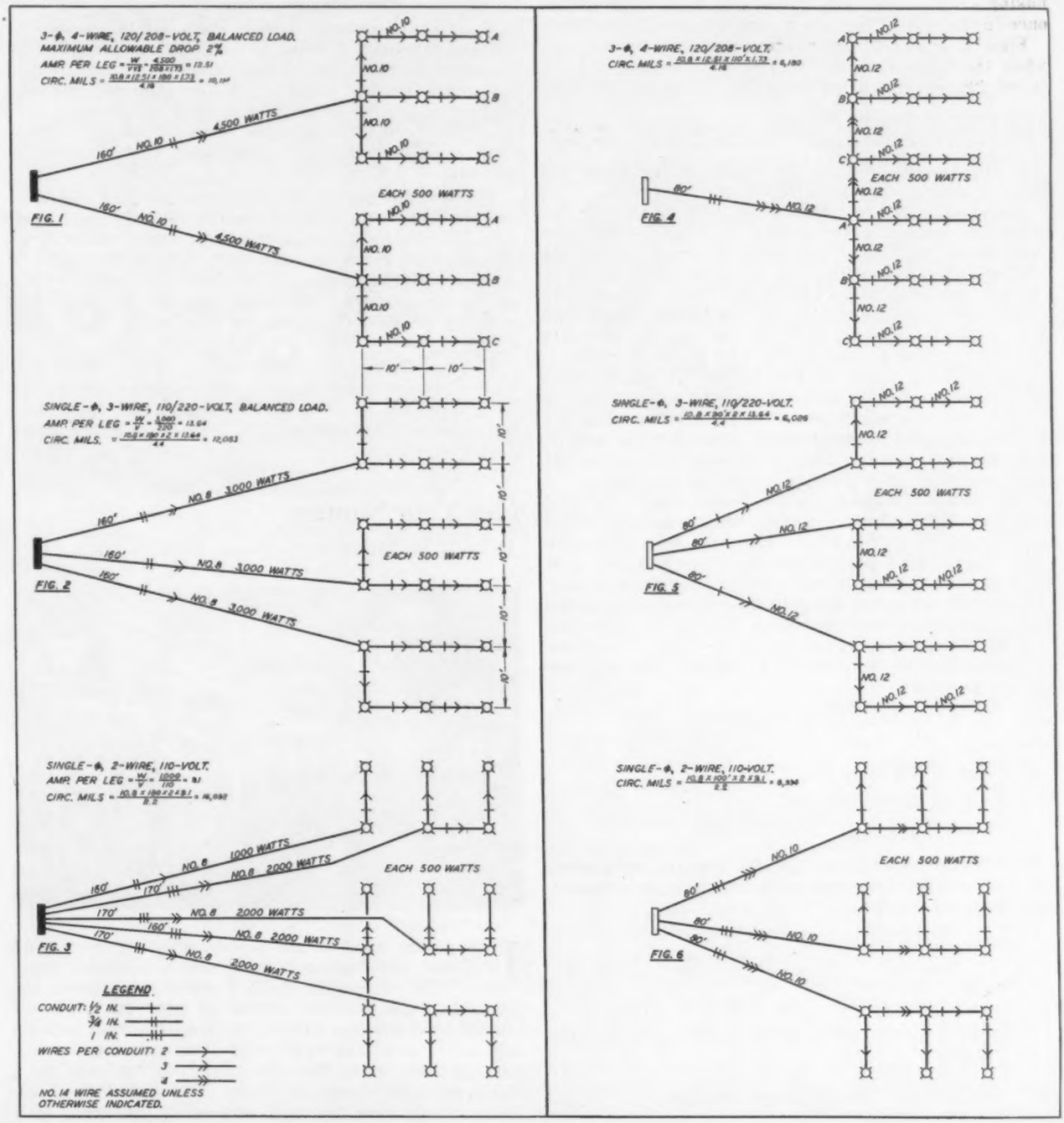
480 ft. ¾-in. conduit	@	$13.00 per 100	$ 62.40
6 ¾-in. bushings	@	2.50 per 100	0.15
12 ¾-in. locknuts	@	1.50 per 100	0.18
1,480 ft. No. 8 r.c. wire	@	30.00 per 1,000	44.40
330 ft. No. 14 r.c. wire	@	10.00 per 1,000	3.30
			$110.43
Total for Fig. 2			$136.33

Fig. 3—Boxes, etc., as in Fig. 1 $ 25.90

Feeder conduits and wire

160 ft. ¾-in. conduit	@	$13.00 per 100	$ 20.80
670 ft. 1-in. conduit	@	19.00 per 100	127.30
2 ¾-in. bushings	@	2.50 per 100	0.05
8 1-in. bushings	@	5.00 per 100	0.40
4 ¾-in. locknuts	@	1.50 per 100	0.06
12 1-in. locknuts	@	2.50 per 100	0.40
3,070 ft. No. 8 r.c. wire	@	30.00 per 1,000	92.10
270 ft. No. 14 r.c. wire	@	10.00 per 1,000	2.70
			$217.91
Total for Fig. 3			$243.81

Diagrams of typical comparative wiring systems as referred to in the text


3-φ, 4-WIRE, 120/208-VOLT, BALANCED LOAD.
MAXIMUM ALLOWABLE DROP 2%
AMP. PER LEG = W/E = 4,500/208 x 1.73 = 12.51
CIRC. MILS = 10.8 x 12.51 x 160 x 1.73 / 4.16 = 10,144
160' NO. 10 4,500 WATTS
EACH 500 WATTS
FIG. 1
SINGLE-φ, 3-WIRE, 110/220-VOLT, BALANCED LOAD.
AMP. PER LEG = W/E = 3,000/220 = 13.64
CIRC. MILS = 10.8 x 180 x 2 x 13.64 / 4.4 = 12,083
NO. 8 3,000 WATTS
EACH 500 WATTS
FIG. 2
SINGLE-φ, 2-WIRE, 110-VOLT.
AMP. PER LEG = W/E = 1000/110 = 9.1
CIRC. MILS = 10.8 x 180 x 2 x 9.1 / 3.3 = 11,980
NO. 8 1000 WATTS
NO. 8 2000 WATTS
EACH 500 WATTS
FIG. 3
LEGEND
CONDUIT: ½ IN. ¾ IN. 1 IN.
WIRES PER CONDUIT: 2 3 4
NO. 14 WIRE ASSUMED UNLESS OTHERWISE INDICATED.
3-φ, 4-WIRE, 120/208-VOLT.
CIRC. MILS = 10.8 x 12.51 x 110 x 1.73 / 4.16 = 6,180
EACH 500 WATTS
FIG. 4
SINGLE-φ, 3-WIRE, 110/220-VOLT.
CIRC. MILS = 10.8 x 90 x 2 x 13.64 / 4.4 = 6,026
EACH 500 WATTS
FIG. 5
SINGLE-φ, 2-WIRE, 110-VOLT.
CIRC. MILS = 10.8 x 100 x 2 x 9.1 / 3.3 = 8,330
EACH 500 WATTS
FIG. 6

Comparing the totals:

Fig. 3 costs $243.81, or 100 per cent.
Fig. 2 costs $136.33, or 55.8 per cent: a saving of 44.2 per cent.
Fig. 1 costs $ 99.32, or 40.7 per cent: a saving of 59.3 per cent.

Material and labor costs for the local outlet groups, being so nearly equal, may be ignored; the real difference in costs lies principally in the feeders. It is safe to assume that the labor required on the feeders maintains approximately a constant relation to the material cost. Therefore,

Fig. 3. $243.81 — $25.90 = $217.91, or 100 per cent.
Fig. 2. $136.33 — $25.90 = $110.43, or 50.7 per cent; a saving of 49.3 per cent.
Fig. 1. $ 99.32 — $25.90 = $ 73.42, or 33.7 per cent: a saving of 66.3 per cent.

Note that Figs. 1 and 2 each require a 6-circuit distribution panel, but that Fig. 3, with nine circuits, would require a 10-circuit panel. The only difference between a 4-wire and a 3-wire panel-board is in the busing arrangement and, therefore, there is no difference in the cost of manufacturing when made to order.

Figs. 4, 5 and 6 demonstrate the comparative cost when the home runs are shortened. Omitting the detailed figures and using only the totals for feeders:

Fig. 6 costs $80.40, or 100 per cent.
Fig. 5 costs $42.34, or 50 3 per cent: a saving of 49.7 per cent.
Fig. 4 costs $31.10, or 38.6 per cent: a saving of 61.4 per cent.

It will be seen that, as the length of the home run becomes shorter, the disparity in cost decreases.

Abandoning 2-wire circuits, but still using only the totals for feeders, a comparison of 3- and 4-wire circuits shows that Fig. 1 represents a saving of 33.5 per cent over Fig. 2, and that Fig. 4 represents a saving of 16.7 per cent over Fig. 5. Thus, the 3-wire circuit compares much more favorably with the 4-wire circuit than does the 2-wire system. Moreover, the shorter the home run the better the comparison. The reason for this is obvious from a study of the different circuits: Nine wires are required to feed six circuits with the 3-wire system, whereas eight wires will feed the same six circuits with the 4-wire system. Each hot leg will be carrying less current and, therefore, will carry the same load a greater distance at any given drop.

For instance, consider a sub-feeder having a total length of 225 ft. from the main switchboard to a distribution panel with a total load of 70,000 watts. The usual engineering practice is to figure a 2 per cent drop on branch circuits and a 1 per cent drop on sub-feeders. At peak load the delivered voltage is approximately 118/204; therefore, with a total distribution loss of 3 per cent, the voltage at the lamp would be between 114 and 115 volts on the 3-phase system. The amperes per leg would be:

$$\frac{70{,}000}{208\ \sqrt{3}} = 194.4$$

The size of the cable would be:

$$\frac{10.8 \times 225 \times 194 \times \sqrt{3}}{(1\%)\text{ or } 2.08} = 392{,}094 \text{ circ. mils}$$

This would necessitate four 400,000-circ. mil cables and a 3-pole, 200-amp. switch on the main switchboard, plus these materials:

210 ft. 3½-in. conduit	@	$110.00 per 100	$231.00
3 3½-in. ells and couplings	@	10.40 each	31.20
2 3½-in. bushings	@	88.00 per 100	1.76
4 3½-in. locknuts	@	40.00 per 100	1.60
1,000 ft. 400,000-circ. mil cable	@	510.00 per 1,000	510.00
		Total	$775.56

Computing for the 3-wire feeder required to meet the same condition:

$$\frac{70{,}000}{220} = 318.5 \text{ amperes per leg}$$

$$\frac{10.8 \times 225 \times 2 \times 318}{2.2} = 702{,}491 \text{ circ. mils}$$

This would necessitate three 700,000-circ. mil cables and a 2-pole, 400-amp. switch, plus these materials:

210 ft. 3½-in. conduit	@	$110.00 per 100	$231.00
3 3½-in. ells and couplings	@	10.40 each	31.20
2 3½-in. bushings	@	88.00 per 100	1.76
4 3½-in. locknuts	@	40.00 per 100	1.60
775 ft. 700,000-circ. mil cable	@	880.00 per 1,000	682.00
		Total	$947.56

Comparison of the two costs shows that a saving of 18.2 per cent is made with the first system. Moreover, there would be less labor involved in pulling in the 400,000-circ. mil cable than in the case of the larger cable, and less danger of damaging it. The 200-amp. switch would cost less than the 400-amp. unit, particularly if the specifications call for type "A" switches in all sizes above 200 amp.

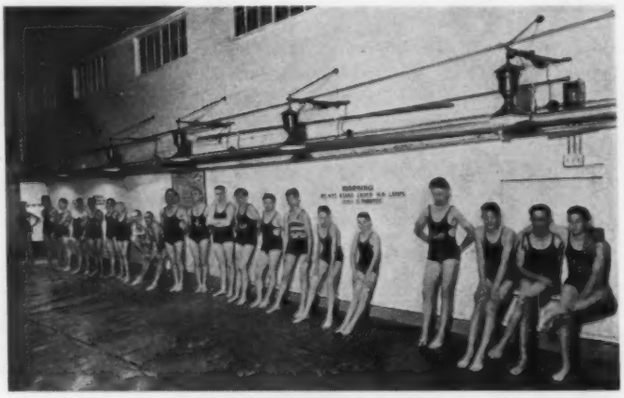
Some engineers lose part of the possible economy by making the neutral twice as large as the phase wires. There is no more reason for enlarging the neutral of a 3-phase circuit than there is for enlarging the neutral of a 3-wire, single-phase system, although it is good engineering to do so in both cases if it is known that the load will be unbalanced for considerable periods.

Do not confuse the percentage saved on the branch circuit home runs and sub-feeders with the percentage saved on the total cost of the installation; many items, though they enter into the cost, remain the same regardless of the system used. Those included in this study constitute a very large part of the total cost and the savings which can be effected on those items alone is worth while.

In general, this statement will cover the whole subject of comparative costs of the systems mentioned: The larger the building and the longer the home runs, the greater the saving effected by the use of a 3-phase, 4-wire system.

▼

Get Your Suntan While It Snows



IT'S pretty hard to get a suntan when there isn't any sun, but Denver citizens aren't worrying about that this winter, for F. D. Fowler, manager of the Lakeside Park enclosed swimming pool, has installed ten 450-watt General Electric sunlamps so that patrons may swim and bake even when it is snowing outside. And in addition to the sunlamps, the pool has been equipped with three batteries of underwater floodlights; these have the dual purpose of making it easy

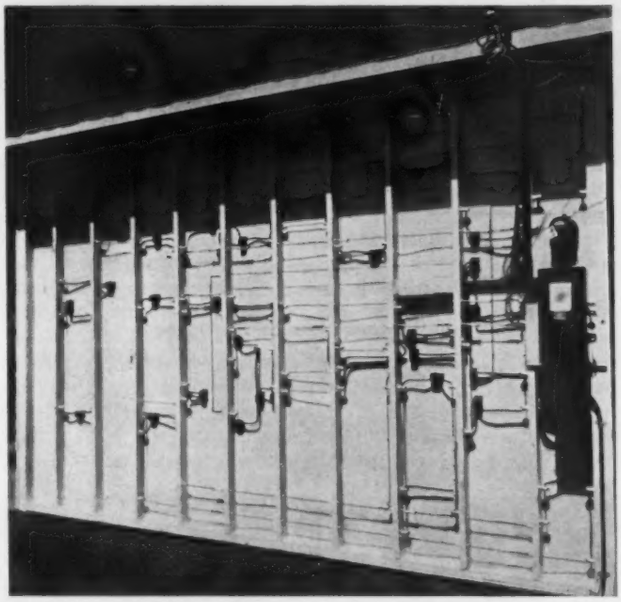
for the life guards to watch all the swimmers and of eliminating underwater "traffic hazards."

Dana Rowten, Public Service Co. of Colorado illuminating engineer, gave Mr. Fowler the idea and Hendrie & Bolthoff, Denver General Electric distributors, supervised the installation. Six of the lamps are placed in a men's section and four are in an exclusive women's section. Signs are posted to warn bathers about exposure.

Mr. Fowler is happy because his patronage has increased when he expected it to decrease, and he readily gives the sunlamp installation credit for the showing.

▼

Back of the Walls Explained



WIRING is so little appreciated by the public because of ignorance of what it constitutes, in other words, what is buried in the walls of a house. Wiring does not show and hence is not realized as important.

To bring the wiring "skeleton" out of the closet, the Northern Region Red Seal committee of the Pacific Coast Electrical Bureau, under Al Nicoll, chairman, through the cooperation of the Pacific Gas and Electric Co., had Frank Kiefer, northern regional manager of the Bureau, design a Red Seal exhibit for the California State Fair which would expose interior wiring to the public. The front of a 9x16-ft. board contained a drawn diagram of the floor plan of a home, with convenience outlets actually installed, and with 10-watt lamps for lighting outlets and actual switches and a 50-amp. range outlet in place. (See EWEST, Oct. 1, p. 159.) The back of the board, illustrated here, was wired exposed in knob and tube to illustrate that a Red Seal job does not necessarily require conduit installation, and more than that, to impress upon the visitors to the fair the need for skilled and workmanlike installation inside the walls.

"We would explain the Red Seal plan and the switching arrangement from the front of the board," says Mr. Kiefer, "and then take them around to the back of the board to show them just what is required for a Red Seal job, how it should be wired, impressing on them the need for a quality installation by a reliable contractor."

Tabulation of figures as to attendance reveal that, of the 38,060 who visited the P. G. and E. Co. exhibit, 15,500 viewed the Red Seal board. Those given a personal explanation of the plan numbered 555, and a total of 720 copies of the Red Seal plan book were distributed. According to Mr. Kiefer, "It is my firm belief that it has done more than anything in the past to enlighten the public on the Red Seal plan." He urges that similar boards be used in every fair and public exhibit where it is feasible to do so, as the most constructive thing that can be done for a reasable expenditures to acquaint the public with the actual facts as to wiring within the walls.

▼

NEW WIRING METHOD AT WORLD'S FAIR—At the Chicago 1933 World's Fair grounds, all city ordinances and rules have been set aside so that new developments may be tried. One result is the use of 5x5-in. and 2x 1½-in. sheet metal raceways, installed in 10-ft. sections, of 18-gage metal, for all wiring circuits, even feeders. The larger size is used for main feeders, which are separated by asbestos sheets. The wires are laid in the raceways, instead of pulled, and a cover bolted on by means of bolts through the center of the raceway. Another economy claimed lies in the placing of fuse boxes into the raceway at any convenient location, at frequent intervals, reducing the circuit runs. Thus, in effect, taps are made to bus feeders at frequent points. Standardization of wire to two sizes (for feeders, No. 00, and for secondary circuits, No. 12) also makes for economy. The small raceway is used for exhibit signs and corridor lighting, is assembled at the factory and wired at the bench. It is punched for sign type sockets. No. 26 gage metal is used for these raceways. Future utilization of this type of wiring in industrial applications is predicted by its designers because of its flexibility and adaptability to changes in wiring requirements.

ARMORED CABLE STANDARDS STRENGTHENED—As a result of field experience gained from contact with contractors and inspectors through the engineer-director, A. Penn Denton's work, the technical committe of the Armored Conductor and Flexible Metallic Conduit Section of N.E.M.A. has revised the specifications under Underwriters Laboratories requirements for armored cable. The standards have been strengthened on requirements for: (1) covering and assembly, (2) factory tests to secure compliance with the insulating bushing protection, (3) thickness of steel armor and standard dimensions of outside and inside diameters, (4) factory tests for resistance of armor, and (5) markings in the armor itself of type of cable.

MAN-HOUR ESTIMATING MANUAL—An estimating manual, written by Theodore Heinzerling, consulting electrical engineer, based on man-hour calculations, has been announced by its publishers, the Rurick Press, of New York City. Charts of labor data taken from cost records of thousands of buildings, for 71 different types of electrical equipment, including domestic, commercial and industrial buildings, are included in three different classifications: "Competitive," Compensative" and "Conservative."

CORRECTION—An error was made in the article, "Fiber Underfloor Duct Aids Building Planning," appearing in the Nov. 1 issue, p. 192, in stating that the installation was made by the H. S. Tittle Co. The Mills Tower electrical installation was made by the Alta Electric Co. The error resulted from confusing knowledge that the Tittle Co. did the electrical wiring for the original Mills Building.

Supervisory Control For 220-Kv. Station

Remote Control, Long Associated With Savings in Distribution Substation Operation and Now Applied to Govern the Equipment Necessary for a 220-Kv. Tie, Proves Satisfactory and Economical

SPANNING a 20-mile section of the San Joaquin Valley in central California, a single pair of wires forms the channel for operation of the unattended, 220-kv. Bellota substation of Pacific Gas and Electric Co. This is believed to be the first 220-kv. substation to be placed under remote control and is the first two-wire visual type of control to be placed in operation on the Pacific Coast.

Bellota substation is located at the intersection of the two 220-kv. Tiger Creek-Newark transmission lines of the P.G. and E. system and the Caribou-Brighton-Wilson 165-kv. circuit of the Great Western-San Joaquin Light and Power Corp. interconnection. From Brighton to the Wilson substation, the line formerly consisted of twin circuit towers designed for 220 kv. with but a single 165-kv. line installed. A surplus of available power in the P. G. and E. system, due to the completion of the Tiger Creek and Salt Springs plants on the Mokelumne River, and an urgent demand for power in the San Joaquin system, created a need for an interconnection. The cross-over of the high-voltage circuits afforded a very convenient location for such an interconnection.

A new circuit, insulated for 220-kv., was strung on the vacant tower position from Bellota to Wilson, with an extension south to Herndon. At Bellota, this line is tapped from either of the two Tiger Creek-Newark lines by means of 220-kv., motor-operated air break switches. These taps are brought to a common bus, from which the new line to Herndon is fed through a 220-kv. oil circuit breaker. Overcurrent and residual relays are provided to automatically trip the Bellota oil circuit breaker to clear faults on the tie line. Some means of promptly reclosing the breaker to re-establish the tie between the two systems, of course, is essential. In addition, the fact that either of the Tiger Creek-Newark lines may be taken out of service at any time makes it necessary to be able to cut over the Herndon line on short notice.

General view of Bellota substation. The two-circuit line in the foreground is the Mokelumne line into Newark and the single line mounted on the double circuit tower is the Brighton-Wilson line, which carries south the extra circuit from the tie at this station

Manual control of such nature ordinarily requires the services of an attendant on duty 24 hours per day. The annual expense to the company of such an attendant (including salary, interest and depreciation on a cottage, etc.) would amount to a sum which, if capitalized, would be in excess of the cost of the supervisory in place.

P. G. and E.'s Station "A" in Stockton was selected as the best point from which to control the Bellota substation. As this involved a control line approximately 20 miles in length, it was of considerable economic advantage to utilize supervisory control equipment requiring a minimum number of line wires. Furthermore, because of the importance of the Bellota substation, it was considered advisable to provide continuous visual supervision of the apparatus positions.

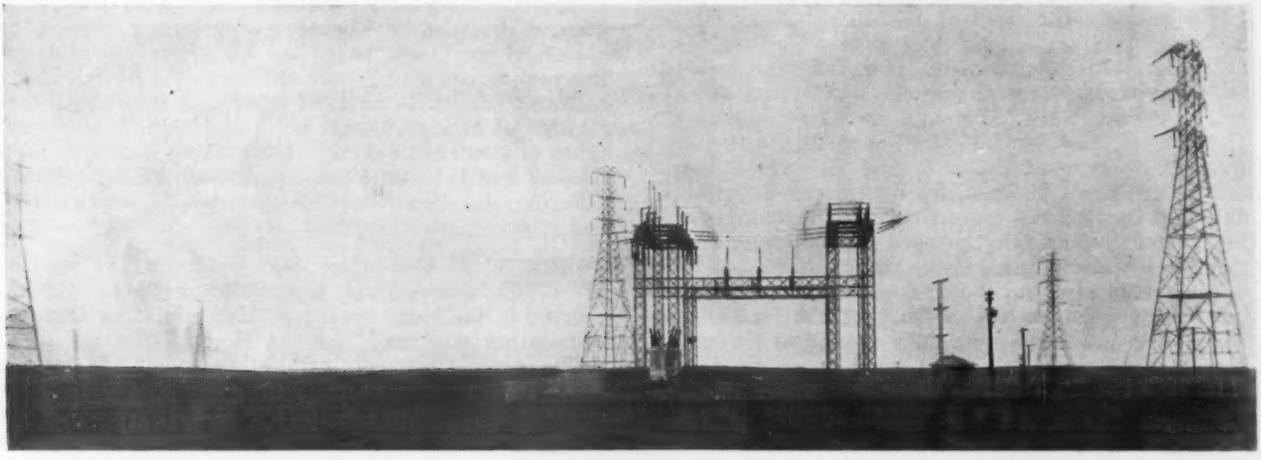
Description of Equipment

Two-wire visual type supervisory control equipment was selected. In addition to providing for the control and supervision of the oil circuit breaker and the two motor-operated disconnect switches, the equipment is wired for five additional points of control and supervision.

The control line is of the open-wire type, located on a separate right of way removed some distance from the transmission line. It occupies poles jointly with the metallic telephone circuit from Tiger Creek to Newark and is protected by a supervisory control discharge gap-type protector unit installed at each end.

In Station "A," at Stockton, there is a control and relay panel of vertical steel construction which is provided with control escutcheons and a miniature bus arranged in a single line diagram of the Bellota substation equipment. The oil circuit breaker and the two motor-operated disconnect switches each are represented by an individual control key and indicating lamp mounted on an escutcheon.

The relay and supervisory panel installed at Bel-



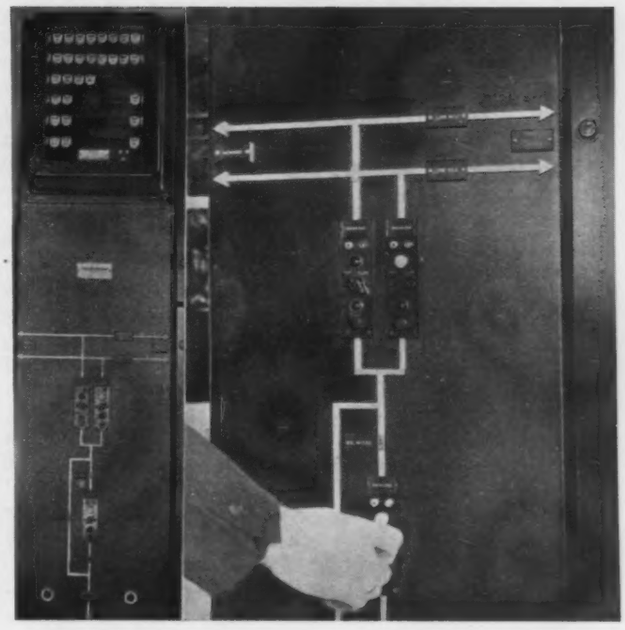
lota also is of vertical steel construction. Mounted thereon are the supervisory relays, interposing type MS relays and type CR relays, the latter providing over-current and ground current protection. The directional elements of the type CR relays are inoperative at present. Standard control switches and associated indicating lamps provide local control of the oil circuit breaker and the two motor-operated disconnect switches.

Electrical interlocking of the two air-break switches at Bellota insures that both switches cannot be closed at the same time. They also are interlocked with the oil circuit breaker in such a manner as to prevent opening or closing their contacts when the oil circuit breaker is in the closed position.

Bellota Substation is operated from Stockton in a manner similar to the way in which an operator at Bellota would control the apparatus by means of the usual local control, and the control is faster than it could be performed by a local operator directed by telephone.

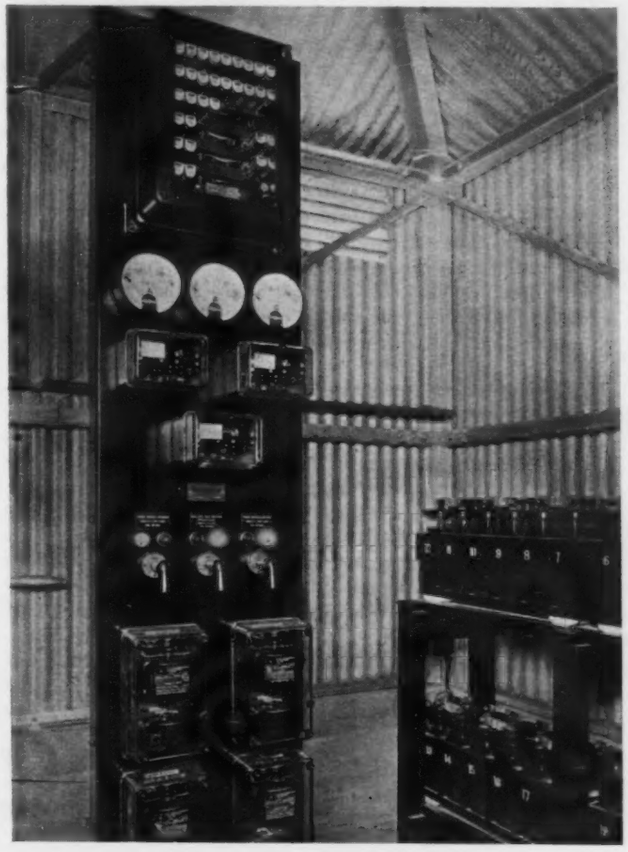
As will be noted from an accompanying illustration, each of the supervisory control escutcheons is provided with a push-type "selection control," or operating key. The pressing of this key initiates the selection of that position, or the temporary assignment to that position, of the two line wires, preparatory to operation of the piece of apparatus assigned to it.

In addition to the customary red and green position indicating lamps, there is an individual point lamp and a disagreement lamp. The former lights when the operation of selecting the position has been completed and provides the operator with a positive check of the correctness of the selection; the latter lights whenever the position of the control key and the position lamp indication are in disagreement, as would be the case following tripping of the oil circuit breaker by automatic relay action. This calls the operator's attention directly to the escutcheon in question and is of particular importance in large installations involving many positions. The disagreement lamp indication is accompanied by an audible alarm which sounds automatically when the breaker trips due to relay action, and which the operator cuts off by pressing the release key.



Left—Panel at Station "A" in Stockton controlling 220-kv. tie at Bellota, 20 miles away. Right—Close-up of the escutcheon showing the relative size of the equipment necessary for the control

Control panel at Bellota substation. Note the small amount of equipment necessary and the compact grouping of supervisory relays in the box at the top of the panel



Operation of Equipment

This type of supervisory control equipment utilizes a selective code system to perform a number of different operations over a single pair of wires. All codes are preceded by a single dummy impulse, which by itself performs no operation, but simply prepares the equipment to receive the effective code. Thus a single impulse imposed upon the line wires from some external source cannot even affect a point selection, the equipment automatically resetting if only one impulse is received.

The control line circuit normally is energized and an impulse is created by momentarily deenergizing the line. Thus a code or series of impulses is produced by simply interrupting the line circuit a given number of times, at definite time intervals. This is in contrast to the general conception of an impulse as being produced by the momentary energizing of a line or circuit.

To illustrate the functioning of the supervisory control equipment, the operation of closing the oil circuit breaker at Bellota will be outlined in detail: The Stockton operator first sets the twist-type control key to the "close" position and then presses the individual selection key located at the bottom of the oil circuit breaker escutcheon; this causes a predetermined series of impulses to be transmitted automatically to the equipment in the Bellota substation. These impulses energize the substation selection relay corres-

ponding to this particular code. When this relay has been energized, the same code automatically is repeated back to the Stockton equipment. This in turn causes the energizing of the corresponding selection relay at Stockton, lighting the small selection lamp at the top of the oil circuit breaker escutcheon. The Stockton operator thus is informed that the circuit between the escutcheon and the circuit breaker has been established and awaits further direction.

It will be noted that the operator should set the twist-type control key to the "close" position before pressing the operate key on the same escutcheon. The reason for this is that when he performs the first operation, the disagreement lamp lights immediately, since the breaker is still in the "trip" position, and this concentrates his attention thenceforth on this position. Following the pressing of the operating key, he then is expecting the point lamp along side of the illuminated disagreement lamp to light up. If a point lamp lights on some other escutcheon, he immediately knows that there is some mistake and, after pressing the release key to restore the equipment to normal, he repeats the operation.

When the correct selection lamp lights, he then momentarily depresses the master control key to initiate the breaker closing code of five impulses. The closing of the breaker changes the position of its auxiliary switch, causing the Bellota substation equipment to return a code of five impulses to the Stockton station. This turns off the green light indicating that the breaker is open, lights the red lamp indicating a closed breaker, and returns the equipment to its normal position of rest. The operator thus is informed that the desired operation has been properly performed. The operation of tripping the breaker is the same except that an operation code of three impulses is utilized.

Should the breaker be tripped automatically by protective relay action, an auxiliary switch contact is made which initiates the sending of a predetermined code to energize the selection relay at Stockton which is associated with the breaker escutcheon. The same code automatically is returned to Bellota to check the selection. If this indicates correct selection, a code of three impulses is transmitted to Stockton; this changes the breaker lamp indications from red to green, lights the disagreement lamp and sounds an alarm bell which rings until cut off by the operator depressing the master release key. Thus the operator is informed of what has happened at Bellota.

The master release key may be used at any time to restore the equipment to its normal position of rest and to cancel any partially-completed operation.

Protection Against Incorrect Operations

Each operation consists of alternately sending and receiving a predetermined series of codes for that operation, the entire sequence being completed in a few seconds. The design is such that each code must be completed correctly or no operation will take place. This gives absolute protection against the possibility of wrong selection and false operation due to the application of foreign voltages on the line wires from external sources, such as induction from adjacent high-tension lines or lightning. The control inherently is anti-pumping, and automatically checks itself.

Guard circuits automatically lock out both the Stockton and Bellota equipments if both should attempt to transmit at the same time. Although very unlikely, this could occur if the Stockton operator initiated a selection by pushing an individual operate key at the same instant that the breaker tripped due to relay action. Regardless of whether the number of impulses being transmitted by the two equipments is equal or unequal, lockout results. Receiving no indication on his point lamp, the operator would press the release key and restore the equipment to normal, after which the Bellota equipment automatically would send in the proper codes to change the breaker lamp indications.

Substation equipment always has the right-of-way. In the case outlined in the foregoing paragraph, the Stockton operator would be prevented from taking control of the line to perform an operation until the Bellota equipment had sent in the change in position of the oil circuit breaker.

It is of particular interest to note that even the very rare combination of both an equipment error and a human error cannot result in a wrong or false operation. If, during normal impulsing, line trouble develops, or an induced power or lightning surge occurs on the line, it is entirely possible that a false impulse may be added to the code being transmitted. This would result in a wrong selection either at Bellota or Stockton, or both, depending on whether the impulse was gained in transmission to or from Bellota. For instance, should the Stockton operator initiate the selection of position No. 2, and should an impulse be gained as just outlined, this would result in setting up selection relay No. 3 and lighting point lamp No. 3, rather than No. 2.

As noted in the recommended procedure previously outlined, the operator should set the twist-type control key before pressing the operate key. However, the worst possible combination of circumstances is set up if it is assumed that the operator's first action is to press the operate key on position No. 2 and that when point lamp No. 3 lights he forgets that he started to operate position No. 2, proceeds to twist control key No. 3 to the "close" position and then pushes the master control key. Even with these conditions obtaining, no operation can take place, the equipment continuing to impulse indefinitely until the release key is operated.

Insurance against a wrong operation, under the circumstances outlined, is provided in a rather simple manner: Associated with each escutcheon or position is an individual point relay which is energized when the equipment is at rest. The pressing of an individual operate key causes its associated point relay to drop out. Another group of individual point relays is responsive to the selection code returned by the substation, and they are the relays which control the point lamp circuits. The circuit design is such that not only must a relay be operated in both of these two groups, but the two relays must be associated with the same position, in order to make it possible to perform a breaker operation.

The supervisory control equipment is composed entirely of extremely simple, multi-contact relays of only one type, requiring a very small amount of occasional maintenance. The same group of relays is used for transmitting and receiving the codes at each station.

Very complete tests were made prior to placing the supervisory control in regular service and no adjustments of any kind were found necessary and no troubles have developed in service. A review of the operating experience up to date reveals a number of automatic operations due to the protective relay action caused by tie-line faults, the breaker being reclosed from Stockton in each instance. In addition, the tie line has been transferred periodically from one to the other of the Tiger Creek-Newark lines.

This installation demonstrates supervisory control to be as applicable to substations of the highest voltage class as it is to the distribution substations where it has been applied so universally in the past.

Problems and Economies of Rebuilt Oil Switches

In Adapting Scanty Budgets to the Demands of System Growth, the Operating Engineer is Confronted with the Problem of Greater Utilization of Existing Equipment. His Solution Provides Data for No. 6 of the Series on Utility Economics—the Rebuilding of Oil Circuit Breakers

By R. E. ROWLEY, JR.
Electrical Engineer, Los Angeles Bureau of Power and Light

RAPID growth of high-voltage transmission systems in the last decade has placed tremendous burdens on the operating engineer, primarily because radical improvement in the design of electrical apparatus has made it increasingly difficult to meet modern service requirements with the now obsolete equipment that was new only a few years ago. Consumer demands for better service and the unwieldy size of the systems involved tend to complicate the problem of system betterment, the solution of which opens three courses for the engineer to pursue:

Equipment may be maintained at the highest degree of protection allowed by the design; or

Improvements may be made to existing equipment; or

New equipment may be substituted for the old, the latter being salvaged.

Under the present conditions, the latter alternative usually is impractical due to excessive costs and will not be considered in this discussion, while adequate maintenance will be subordinated to the consideration of the improvements which may be made to existing installed equipment to make such equipment conform with modern operating requirements. Oil circuit breakers have been selected for this discussion of the factors involved in rehabilitation, not only because their mechanical design conforms to the requirements of practical reconstruction, but also because they are subject to rapid depreciation from inadequacy due to system growth and stability factors.

Safety and Venting

One of the most important factors to be considered in the reconstruction of an oil circuit breaker is providing for internal pressure generated during an interruption. A major fault in many oil circuit breakers of the old types has been the weakness of the tank structure and the inadequacy of the venting system. The fire hazard from oil has been overcome in many types of switches by providing adequate tank strength and venting.

In considering the problem of tank strength and the venting of oil circuit breakers, one must recognize three sources of pressure development. These are: first, the normal gas products of a short-circuit interruption; second, a secondary explosion caused by the ignition of the mixture of air and gas in the space above the oil following an interruption; and third, the gas generation due to an internal maintained arc. To determine the working pressures in switch tanks and the design of a venting system, each source of pressure must be analyzed.

Pressures built up by the arc during short-circuit interruptions are of two characters: that of the initial gas generated which may build up pressures of considerable magnitude before the inertia of the oil is overcome and the gas bubble allowed to expand, and that of the secondary pressure, which builds up in the switch tank until a point of equilibrium is reached when the vent carries off gas as fast as it generates.

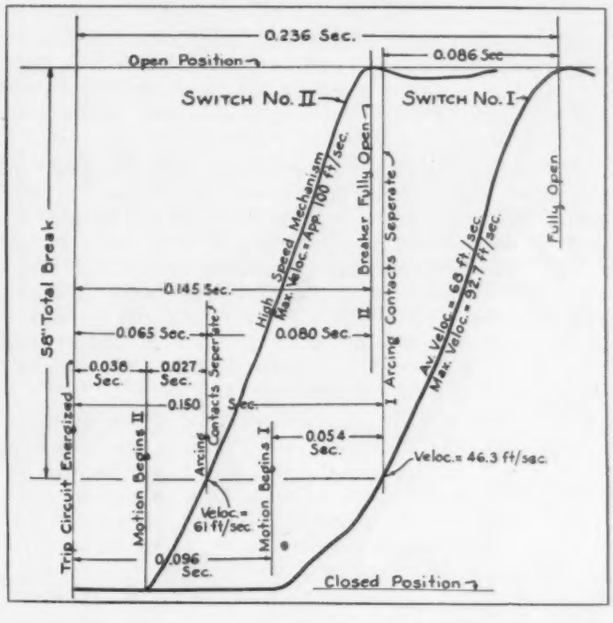
The secondary explosion, when under atmospheric pressure in a closed space, can be calculated to be less than 200 lb. per sq. in. for a perfect mixture of gas and air in the air space of an average switch. Actual service experience has shown that the theoretical pressures are not developed, so most of the switches today are designed for 100 lb. working pressure.

The third possible cause of excessive pressure is an arc which persists due to an internal fault in which the pressure developed may be unlimited, because the switch in effect then becomes an electrical boiler. A specific case of an internal fault in a switch tank with a short-circuit interrupting duty of 1,000,000 kva. will be considered. The worst condition would be a partly-opened blade with a persistent arc in conjunction with a 3-phase short circuit. Each tank then would be carrying one-third the total fault current. Assuming the highest possible power factor to be 50 per cent, the greatest possible amount of energy dissipated in one tank will be:

$$\frac{1{,}000{,}000}{3} \times 0.5 = 166{,}666 \text{ kw.}$$

Using the maximum gas generation of 120 c.c. per kw.-sec. (a figure agreed upon by most authorities), the volume of gas

Fig. 1—Time-travel curves of a breaker taken before and after a high-speed operating mechanism was installed showing the improvement in operating performance made possible by proper reconstruction



From a paper presented at the Vancouver convention of the A.I.E.E., Aug. 30-Sept. 2, 1932.

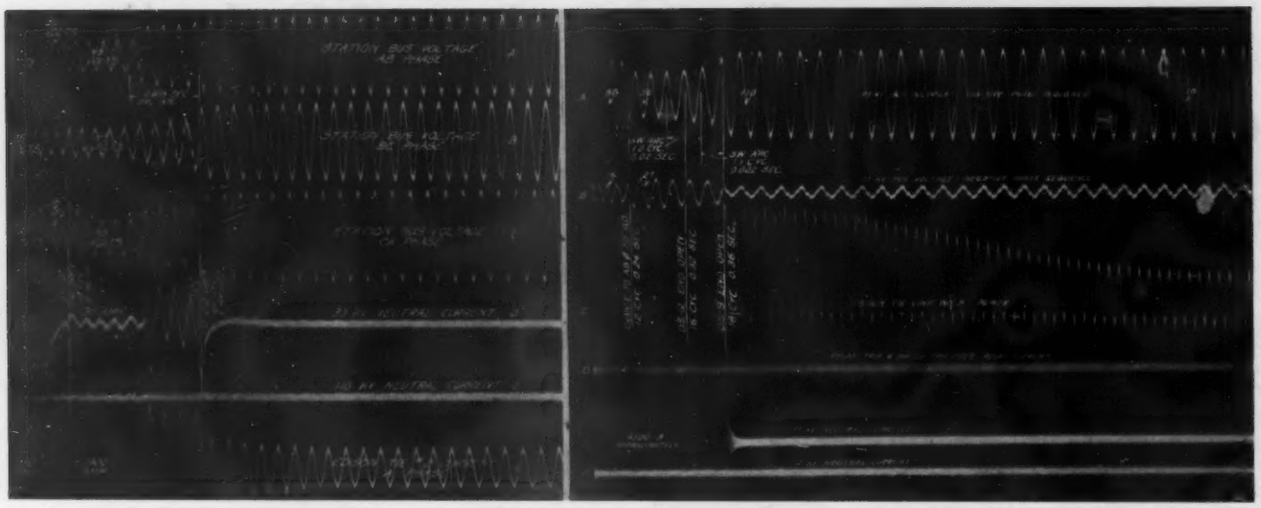


Fig. 2 (above) Operating performance of a 33-kv., 300-amp., 6-break oil switch before being rebuilt with improved arc contacts and a high speed mechanism. Fig. 3 (right) Operating performance of the same switch after being reconstructed. Of importance is the decrease of 4 sec. in time to clear the cable and the decrease of 3.4 cycles in the time of the arc

to be vented can be determined by the use of Church's formula for the flow of gases through pipes with a large pressure drop:

$$P_1^2 - P_2^2 = \frac{KQ^2L}{d^5} \qquad (I)$$

In which P_1 = the initial pressure in lb. per sq. in.

P_2 = final pressure in lb. per sq. in.
Q = volume of free gas generated in cu. ft. per min.
d = diameter of pipe in in.
L = length of pipe in ft.
K = a numerical coefficient $0.0005\sqrt{G}$, where G is the density of the gas.

Assuming that the switch tank is designed for 100 pounds pressure with the vent exhausting to the air through a 10-ft. run of pipe, the safe side of vent may be calculated. If it is assumed that $P_1 = 100$ lb. and $P_2 = 0$, then Q is calculated:

$$Q = \frac{120 \times 60 \times 0.061 \times 166{,}666}{1{,}728} = 43{,}920 \text{ cu. ft. per min.}$$

G = 0.28, as calculated from the various component densities of the gases.

Substituting these quantities in (I):

$$100^2 = \frac{0.0005 \sqrt{0.28} \times 43{,}920^2 \times 10}{d^5}$$

Then,

$d = \sqrt[5]{520} = 3.5$ in.

The proper design for a switch for 1,000,000 kva. interrupting duty should then have a minimum vent diameter of at least 3½ in. if a 10-ft. length of pipe is used. A second vent may be provided with either a 1½- or 2-in. vent equipped with a muffler to care for ordinary switch interruptions. As internal faults are exceptional, the larger vent may be considered an emergency valve and sealed with a blowout diaphragm designed to blow out at approximately the working pressure capacity of the switch tank.

Closely allied with adequate venting is the problem of tank strength. In cases where circuit breakers are being rebuilt for increased duty, this factor should be given full consideration, as was done in the case of a group of 33,000-volt, 2-break, 250-amp. breakers which were reconstructed to provide faster operation and to increase their interrupting capacity from 150,000 kva. to 250,000 kva. These particular switches, in their original form, were equipped with light metal rectangular tanks. During short-circuit interruptions these tanks had become ruptured or distorted and the switch contacts had received severe burns. Cast steel tops were substituted for cast iron tops, and flat-bottom oval tanks, made of quarter-inch boiler plate, took the place of rectangular tanks; reinforcing grids were added to the sides and bottom of each so that the assembled switch would hold a hydraulic pressure of 150 lb. A common manifold header, provided with baffles, was fastened across the switch tanks to act as a combined vent and muffler. The operating mechanism was rebuilt for dependable, fast service and the indoor bushing changed to a heavier type to balance with line insulation. Cost of these major changes varied from 1/3 to 1/2 the price of a new switch, a large saving because the salvage of the original equipment was based on scrap values; at the same time the original dimensions were retained, thereby eliminating changes in cell and bus construction.

Improved Operating Performance

So far only the mechanical improvements incident to higher interrupting capacities have been considered. Improved operating performance involves not only contacts suitable for the increased duty imposed by increased capacities, but also a consideration of operating speeds with reference to system stability and the freedom from excessive contact maintenance.

Where the design of the original breaker permits, substituting contacts of modern design is a most satisfactory method of improving performance. These contacts employ some form of arc extinguishing mechanism to supplement the conventional method. In applying these new developments to older breakers, it usually is found necessary to make additional changes, such as supplying new lifting rods and guides, substituting new types of bumpers and changing the length of stroke to insure better clearance around the contacts, which in turn requires one or two additional levers. From this it will be seen that the question of the expense involved varies considerably, depending upon the breaker and the desired performance. However, it is safe to assume that such changes will require development expense which will of necessity be borne by the purchaser. The cost of converting old breakers in this manner is approximately 30 per cent of the breakers, an appreciable saving over a new replacement while accomplishing about the same results.

Stability studies have fostered the increase in circuit breaker operating speeds. In studying the effect

of switch operation, travel-time curves obtained from a speedograph and oscillograms of switch performance are particularly helpful. To obtain increased operating speeds, modern high speed operating mechanisms are adapted to the old breaker. Reference to Fig. 1 will show the effect of substituting a high speed mechanism on a 110-kv., 600-amp., 6-break switch. Travel-time curve 1 shows the original operating performance and curve 2 shows the operations after the new mechanism had been installed. Having made the point of energizing the trip coil common for both curves, an analysis of each is worked out on the chart for direct comparison. The velocity of the moving contacts may be computed from the slope of the trace at any desired point. Time elements are shown clearly so that the effect of any changes or adjustments may be studied immediately and easily. The overall time of 0.145 seconds or 8.7 cycles for the improved switch, as compared with the original time of 14 cycles, obviously would aid in maintaining stability and in reducing damage during system short circuits. The improvements cost one-tenth the original price of the switch.

Real and tangible benefits obtained through increasing the speed of the break, due to decreased time of arcing, have been quite evident in rebuilding high voltage switches. With multi-break switches, having combined arc-contact velocities of 50 ft. per sec. at time of parting and a maximum of 75 to 100 ft. per sec., arc lengths as measured during interruptions have been found uniform at from one to two cycles on a 50-cycle system. This arc time does not seem to vary with interruption from 100,000 to 1,000,000 kva. Switch stresses and arc-contact burning have been appreciably lessened as speeds have been increased, and oscillograph records of system short circuits very clearly show the decreased time of arcing obtained with the higher contact velocities. The speed of arc-contact parting is the most critical point of the entire switch operation, and should be favored in any changes since the switch arc is nearly always extinguished before the maximum velocity becomes effective.

In one instance, a group of 110-kv. multi-break switches built in 1911 were investigated to determine the feasibility of improving operating speeds. The mechanism (particularly the moving contact assembly) was found to be too heavy for the required speed of operation, so a simplified high-speed mechanism was substituted and a new set of contacts constructed of duralumin. Smoother and faster operation thus was obtained with a decrease of one-third of the weight of the moving contacts, and the operating speed was reduced from 11 cycles to 2.6 cycles. These changes, reducing the time to clear all contacts to less than one-third of the original, cost less than half the price of a new switch, and test performance indicates that many years have been added to the life of the equipment.

Figs. 2 and 3 show the oscillographic record of performance of a 33-kv., 6-break, 300-amp., frame-mounted switch before and after it had been rebuilt with improved arc contacts and a high speed mechanism, which raised the speed of arc-contact parting from 20 to 48 ft. per sec.

Table 1—Operating characteristics of a 6-break, 33,000-volt oil circuit breaker rebuilt from 300 to 600 amp. and from 600,000 to 1,000,000 kva. interrupting capacity.

OPENING	Before making changes	After making changes
Minimum volts at which switch opened	75	75
Current taken by opening coil at 110 volts(amp.)	35	14
Maximum velocity of break, ft. per sec.	38.5	78
Velocity at arcing contacts, ft. per sec.	25	46.5
Time for total travel of blades, seconds	0.14	0.10
Time for energizing control circuit for arcing contacts to open, seconds	0.24	0.19

CLOSING	Before making changes	After making changes
Minimum volts at which switch closed	100	80
Current taken by closing coil at 110 volts (amp.)	137	105
Maximum velocity of closing, ft. per sec.	18	34.5
Velocity at arcing contacts, ft. per sec.	18	33.5
Time for total travel of blades, seconds	0.33	0.23
Time for energizing control circuit for arcing contacts to close, seconds	0.63	0.40
Total break, in inches	24	35

Typical Switch Reconstruction

To give a complete description of the betterments to a typical line of breakers, 33-kv. oil switches will be used as an example. These switches were in service on a 33,000-volt position for a number of years, the original rating being 300 amp. and 600,000 kva. interrupting capacity. As the system grew, a 600-amp. switch was required with a 1,000,000 kva. interruption capacity. The need for heavier duty characteristics was manifested during interruptions by excessive oil loss, the tanks moving on their bases and damage occurring to the mechanisms due to tank jumping caused by excessive oil throw. The main contacts received burns because of insufficient protection from the arc contacts. In addition, a faster operating speed was desired in connection with a bus relay system for ground protection and for system stability.

Study of the tank and fittings showed that they could be reinforced or changed to meet a working pressure of over 150 lb. per sq. in. One of the tanks was so reinforced and then subjected to a series of explosion tests in which gunpowder simulated an electric arc under oil. It was found that a single tank would jump over 12 in. due to oil throw with pressures recorded of less than 150 lb. The findings proved very useful in explaining past performances, and indicated that, in general, the pressure varied inversely with the air volume above the oil and the tank jump varied directly with the height of the oil above the contacts and directly with the depth of air space above the oil. As a result of these experiments the contacts in this group of switches were raised to reduce the head of oil above the contacts and the oil level was raised to decrease the air space above the oil, thereby decreasing jumping by one-half.

A 4-in. pipe vent from each tank was provided with a bakelite diaphragm designed to rupture at 112-lb. pressure. This has since proved its value in the case of a bushing failure inside the switch tank. The vent provided adequate relief to the tank, but a gas explosion in the switch cell demonstrated the necessity of carrying all vent gases to the open air.

Mechanical changes included heavier current-carrying parts, new butt-type arc contacts were installed for heavier interruption duty and to provide better protection for the main contacts, the solenoids were rebuilt, stronger springs were provided to speed up the opening, and internal dashpots were built into the plunger rods to avoid mechanical jamming. Many refinements of parts were included to decrease over-all time of tripping and to increase the opening speed of arcing contacts. The switch performance before and after changes were made is tabulated in Table 1. The strength of tanks was more than doubled, while the effective arc gap was increased by one-half, the speed of the break was doubled, and overall opening time was decreased one-quarter.

The cost of rebuilding these switches was about one-half that of equivalent switches. They now operate on a 3-phase cable position calculated for 1,000,000 kva. interrupting duty and handle interruptions effectively with minimum maintenance.

First Five Hundred Are the Hardest

So Los Angeles Bureau of Power & Light Decides to Remove the Wiring Obstacle and Launch the City Upon the Use of More Electric Ranges, Sold by Dealers

LAUNCHED upon an aggressive load-building program directed at the domestic market, the Los Angeles Bureau of Power & Light, with the cooperation of electric range distributors, the department stores and retailers of electrical ranges throughout the city, has decided to offer as a special merchandising inducement the wiring of the first 500 ranges placed on its lines in this winter's campaign. This decision is the outgrowth of months of negotiation and preparation, in which finally the right to invest in facilities for opening up the range market was upheld by city attorneys. This investment is being considered a promotional expense chargeable to the winter range campaign for the purpose of adding at least 500 new range users to the system load. Many months ago a promotional fund for load building in range and refrigerator new business was authorized by the commission, out of which the expense of this new feature is to come.

Sponsors of the cooperative winter range campaign, which began Nov. 15 and will continue until approximately Feb. 15, 1933, were brought together under the leadership of Burdette Moody, business agent, Bureau of Power & Light, and Arthur Elliott, manager of the display department. The range committee is headed by D. C. Pence, Westinghouse Electric Supply Co., and representatives from the General Electric Supply Corp.; Graybar Electric, Inc.; Ungar & Watson, Inc.; Leo J. Meyberg, Inc.; Standard Ranges; and The Electric Corp.

In the plan book of the campaign, this statement is made in reference to the wiring plan:

"Free wiring will be the merchandising feature! Retailers will have full control of this merchandising weapon as a means of CLOSING sales after the general promotional and advertising campaign has aroused public interest and created prospects. Free wiring will not be mentioned in the advertising. Only range buyers on municipal system lines will receive this wiring cooperation."

In the cooperative range program, with the bureau itself doing no merchandising, certain requirements have been asked of participants. Distributors are asked to consign sufficient ranges to make displays in the main appliance room at 207 South Broadway and other branch offices, to consign at least two ranges for demonstration purposes, to supply window trim and display material, to cooperate in special sales campaigns in dealer establishments, to provide the bureau with accurate lists of dealers, to hold sales meetings to instruct dealer salesmen in range selling, to refrain from advertising the free wiring feature, to see that dealers display ranges at least a week per month.

Dealers cooperating are asked to agree to stock and display ranges, report accurate information for wiring installation, secure permission from owner where necessary for wiring done on behalf of a renter.

The bureau itself agrees to sell only through the dealer, carry on an advertising campaign, release publicity schedules in advance so that dealers may tie in, maintain range displays in its offices and, when required, deliver, install and test ranges from dealers' floor or wholesale house for $5. It will make home demonstrations on all ranges sold, conduct cooking classes, assist in conducting instruction programs for dealer salesmen, train servants in the use of the electric range and maintain a group of salesmen to assist in the general training of dealer salesmen when requested.

It will install, without cost to the dealer, the wiring for the first 500 ranges on bureau lines, if installed before July 1, 1933. Ranges must be of makes approved by the bureau, and having a minimum of three elements, one of which must be over 2,000 watts capacity, and have an insulated oven with automatic temperature control. Further provisions are that the installation must be possible with a 60-amp. switch, otherwise the owner must pay in excess of the 60-amp. installation. Special cases in underground districts must be handled separately. Wiring allowances up to $20 will be made in new dwellings if and when the range is installed and in operation. In multiple-family dwellings, a $15 allowance per range is offered where the ranges are metered separately and a $10 per range allowance where collectively metered.

Wiring will be done by one firm whose quantity and specialization will make a low installation charge possible. This feature of the program has been the most difficult to arrange satisfactorily.

Do You Build Salesmen —Or Bully Them?

M. T. Bowie has no fear of central station merchandising competition; his store is located next to one of City Light's branch offices. And when Puget Sound Power & Light Co. had a store in the same block, he says, business was better still. His theory is that the more electrical buyers that can be brought into the block, the better for all concerned

"RIGHT now, the big job of the electrical dealer is to build—sustain—the morale of his selling personnel. A business can't be bigger than the men who work for it!"

There you have M. T. Bowie's business credo in tabloid form. Mr. Bowie's electric store, Bowie Electric Co., of Seattle, Wash., grossed $60,000 in 1931, and is aiming to go over that in 1932, via "getting out and rustling."

And the salesmen on the Bowie staff do rustle, because Mr. Bowie knows how to train electrical appliance salesmen. His very definite ideas of specialty salesmanship are particularly applicable in these times, when salesmen are liable to catch bad attacks of business blues.

The entire store is the show window, so the interior is kept nicely arranged and well stocked. Moreover, the store is longer than it is deep, so that the farthest appliance can be seen from the street

1. Self-assurance. "The first, and perhaps, the most difficult part of this training is to inspire the salesmen with self-assurance," says Mr. Bowie. "This aspect of the training job is purely psychological. In these times, when men are plentiful, there is a temptation to choose the easiest method—the high-handed system of 'riding' a man. It seems simple to hold an ax over his head and give him to understand that he'd better hit the ball if he intends to have the privilege of selling for us. In fact, we may be tempted to feel that we are doing a man a favor when we give him a chance to earn money. This attitude of charity is just as demoralizing to the spirit of employees as though they were in the bread line. The big stick makes a coward of a man, and a coward can't sell merchandise!

"To be a good salesman with the cocky spirit of initiative that is real salesmanship, it is necessary that he feel secure in his position, that he is performing a real and indispensable role in the organization. There are various ways to create the self-confidence on which we can build a real salesman.

2. Friendship. "One of the best ways is to establish a friendship with the salesman, and often this can be engendered by asking small favors of him. When the boss asks a favor of his employee, and otherwise treats him as an equal, the man's self-worth increases in proportion to the recognition given it by the boss. I have noted this when I ask one of the men to drop in at the bank with the deposit on his way to lunch or ask his help with some difficult collections.

3. Buying co-operation. "Another way of asking a favor of a man, and at the same time gaining his goodwill and increasing his self-assurance, is to enlist his cooperation in purchasing of merchandise. I let one of the men, for instance, select the type of bridge lamp to be featured as a special. Right now, I have on my desk a fixture order made up by the fixture salesman. And when we take on a radically new item or a new line, we have a round-table discussion both before and after it becomes a part of stock. When a man has had a finger in the buying pie, he is vitally concerned with

vindicating his buying judgment; he has a personal interest in moving the merchandise.

4. Managing credits. "Every boss and sales manager has the problem these days, of the salesman who comes in all steamed up about a hot prospect and the prospect of an immediate commission check—and when we get in touch with the credit bureau, we find that the customer's credit is worthless. Then we have to break the sad, sad news to the hopeful salesman. But why incur in our salesman hostility by this procedure? Why not make each seller responsible for getting a credit line on his prospects? We have found this plan utterly practical from all angles. When Jones comes in from a 'hot call,' the first thing he does is to get in touch with the credit bureau. If he does get an n.g. report, he is not nearly so crestfallen, and certainly he is not hostile to the boss, because HE personally has been the receiving medium. It is odd, but with this method the salesman is not nearly so ready to take a chance as he is when he is told the bad news by a third party.

5. Learning from salesmen. "I figure that the boys can teach me a lot. When we get in a new article, or take on a new line, I may ask one of the boys from the shop to give me his opinion of the mechanical details at the conference always attendant upon the introduction of a new item. For example, when we took on the new flat-plate ironer, we had a real discussion, with everybody taking part, as to what should constitute the headline argument in presenting this new idea to Mrs. Housewife. And we all learned a lot from the pool of opinions.

"After all, competition, it seems to me, is not so much in the merchandise itself, in credit terms or in other tangibles, as it is in the intangible element of salesmanship. Why does the prospect select Salesman A's washer, rather than Salesman B's? Perhaps it is because Salesman A is a real fellow, self-assured and assured of his self-worth; a chap who knows his merchandise, who is sincerely loyal and friendly to the business that employs him.

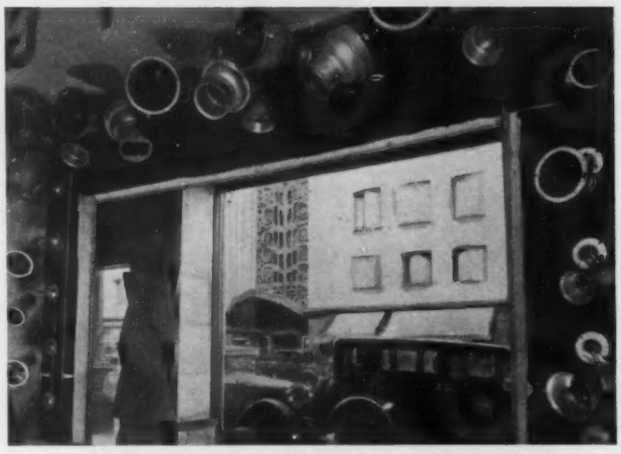
"But salesmen like this do not just happen. They have to be built with scientific materials!"

▼

Stage Flexibility Applied to Windows

THEATRICAL lighting effects have always been a result of complete control of every lighting unit. Windows are but miniature stages, in which, as a rule, a permanent setting and grouping of objects are dramatized to a public walking by on the sidewalk rather than sitting in opera chairs. The very fact that the public which sees a window is merely passing by gives more reason for heightening the dramatic effect in a window. It must capture and hold the attention of people hurrying along with thoughts in their minds other than the merchandise on display.

Yet windows, from the very first installation of lighting, have deviated very little from a standard pattern of lighting; what might be termed the equivalent of a front border in a theater. Recently spots have been added to bring color or additional emphasis of white light upon particular objects. But it remained for an old time theater electrician, W. E. Wuelker, president, Wuelker Reflector Lighting Corp., to develop a simple means of giving absolute control to the display man of each and every lighting unit in a window. Moreover, by a newly-patented, grounded, all-metal, adjustable lamp housing, in which almost any type of reflector can be used, the thing can be done with complete safety and in compliance with Underwriters' requirements.



Reflectors on adjustable housing are each directed by the display man upon a particular detail, utilizing color where needed. The show window becomes a stage, with dramatic effects to stop the hurrying passerby

A demonstration window was recently set up within the Pacific Gas and Electric Co.'s window at the former Great Western Power Co. offices on Sutter St., San Francisco. Using one of that company's syndicated window displays of the range campaign, the adjustable housings made possible the use of one or more colors, in combination, on the rear drape, spots on the range, and color heightening spots on the posters, grass and the cutout of a woman and children at a picnic. An accompanying photograph shows the mounting of the reflectors by means of a housing, in this case on outlet boxes, although a similar arrangement may be used on metal troughing.

In this instance six 300-watt reflectors, equipped alternately with blue and green color screens, were focused on the background, a silk drape on which the painted landscape was heightened by these colors. Placed vertically like strip lights or olivetts at each side of the window, were three 200-watt and four 100-watt reflectors, alternating with blue and green, and focused variously up and down and along the sides to complete the sky wash on the ceiling and side walls. Green spots brightened the artificial grass along the front of the window. Three 250-watt focusing spotlights were directed: one with yellow color screen, upon the figures on the cutout, to give a sunlight effect; a second to bring out the sign on the easel at the left; a third to spot with brilliant white light the main feature, a range. Additional white light was played on the range from two 200-watt reflectors at the extreme right and left top corners of the window.

While this particular window used the full brilliancy of a total of almost 5 kw. in a space about 8x10x8 ft., the possibilities for subtle dramatic effects with this extreme flexibility and control, even with less lighting equipment, opens up new opportunities in window lighting. According to Frank Bevan, display manager for Pacific Gas and Electric Co., "Why should a window be limited to a row of reflectors along the glass, and why should the lighting, and consequently the use of electric energy, stop there. In theatrical lighting intensities of hundreds of foot-candles are concentrated upon the feature attraction. Every window is a stage."

If You Need a Cheap Leader, Make It Non-Electrical

"IF you must sell something of low cost, do not make it appliances," says Mrs. C. M. Jacobsen, manager and owner of the Valley Electric Co., attractive merchandising and electrical contracting store at San Luis Obispo, Calif. "It never pays to carry any cheap appliances. They cause more grief than they are worth and always come back to bring you service trouble."

If a store must have some low-cost articles to attract buyers, Mrs. Jacobsen feels that it should be something other than appliances. She herself has recently put in a varied stock of pewterware which sells for $1 apiece. This is attractive ware of good quality and brings trade to the store. In order to display this type of merchandise, in the remodeling of her store recently, she had placed alongside the doorway a small display case with glass shelves which makes an ideal setting for such ware.

In the remodeling of the pioneer electric store of San Luis Obispo, Mrs. Jacobsen adapted the modern style to her needs. The main window is wide and high and allows an excellent merchandise display of the large appliances. The door, which usually occupies the strategical center position in a store front, has been moved over to one side and the narrow window referred to, for display of small articles, flanks the other side of the door.

Mrs. Jacobsen, herself, views her pewterware case. These are the only low-priced articles she sells.

Though there is no moving display inside the store, the displays are moved periodically and the appliances are moved constantly out of the store

The remodeling has brought a great deal more light into the store and has made a feature of the appliance display. Attractive green and black linoleum floor with side walls and ceiling of celotex in the shape of blocks makes an ideal setting. Fixture displays have been removed to the rear of the store under the balcony or mezzanine.

Mrs. Jacobsen believes in keeping her display mobile and changing it frequently. Tables and stands on casters are utilized to good effect. A constant shifting of the heavier appliances and the full use of manufacturer window display material keep the appliance stock moving in more ways than one.

In these days, believes Mrs. Jacobsen, selling has to be done more carefully so that there will be no reverts, and more intensively so that no opportunity will be overlooked.

▼ ▼ ▼

Cultivate Your Old Customers

WHEN the shop foreman at the Stone Electric Supply Co., Los Angeles, has nothing to do, he dons his hat and goes calling. When the outside man comes in and finds nothing demanding his attention, he changes from overalls to street clothes, loads a supply of electric light globes into his truck and makes the rounds of some apartment houses. Usually there are tenants in need of new lamps; frequently the customer is reminded that she has a waffle iron or toaster or some other small appliance needing repairs, and produces it. Perhaps she recollects that her neighbor across the hall mentioned that morning that she needed a new cord for an electric iron. It is seldom that he does not come back to the shop with several repair jobs as well as cash from the sale of many lamps. And when K. W. Stone, the manager, has a lot of time on his hands, he, too, goes calling on old customers.

"When conditions were brisk, as they were a few years ago," explains Mr. Stone, "we operated with a minimum crew—a skeletonized crew, to be exact—and had a list of journeymen on whom we would call in case we needed extra help for a few hours or days. This system sometimes was a disadvantage, inasmuch as there were periods of extreme rush and then periods of slackness when even our own crew had nothing to do.

"We have changed this, however, and are spreading the calls so that there are fewer peaks and valleys in the work chart. If a customer telephones some afternoon and wants a repair job done right away, we endeavor to get her to let us handle the job the following morning, unless it is an emergency. In this way we can spread the work out and keep two men busy all of the time, instead of three or four men busy part of the time.

"You get a better yield if you cultivate a garden you've already sown. That's what we are doing now—cultivating the customers we have already made, and reaping a satisfactory harvest of profit."

Remarkable Results From New-Type Chick Brooders

By J. C. Scott
Agricultural Engineer, Puget Sound Power & Light Co.

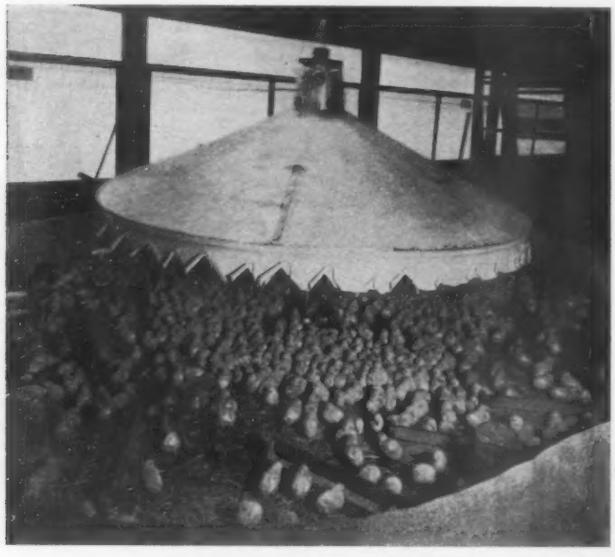
A NEWLY-developed electric brooder, warming the air at the top and forcing it downward under the hover, gave a remarkable performance in an experiment at the Western Washington Experiment Station, Puyallup, carried on by M. Wayne Miller, state poultryman, and Glenn Cushing, Puget Sound Power & Light Co., during the 1932 brooding season. Only 17 out of 1,010 chicks put under the hover were lost, and the total consumption of energy was 509 kw.-hr., or bare fraction over ½ kw.-hr. per chick. This is only half the average current consumption for other types of brooders operating in western Washington. At the end of five weeks the feathers on the chicks' backs were developed so that further heat was unnecessary, and the brood was perched at this age.

The brooder consists of a regular canopy type hover with canvas curtains around the outer edge. Into the top is built a short chimney and in the chimney is mounted vertically a fan and motor. Below the fan, circular type space heaters of 1,660 watts were placed, 250 watts being left on all the time and 1,410 watts being controlled by a thermostat. A sheet iron baffle, 10 in. in diameter with a 4-in. hole in the center, was mounted 6 in. below the chimney inside the hover so as to distribute the air evenly to the chicks on the floor.

This arrangement forced a warm air circulation downward and out the sides of the hover under the curtains, or in other words, just opposite to the circulation of air in the ordinary canopy type of brooder. The excellent health, growth and development of the chicks was due not only to a sufficient amount of warm, fresh air evenly distributed and the total absence of cold drafts, but also to an absolute freedom from sweating.

For the circulating fan, a 6-in. Wagner desk type fan was rebuilt for vertical mounting by drilling an oil hole in the center of the shaft with a connecting hole leading to the lower bearing. The fiber spacing washer was replaced by a bronze washer to carry the thrust. It was found that the normal speed of the motor was too fast for the gentle circulation desired, so the speed of the motor was cut down to 1,100 r.p.m. by placing a 50-watt lamp in series with it.

Forced warm air circulation brooder used at Western Washington Experiment Station. Remarkable results were obtained, both in kilowatt-hour consumption and in decreasing mortality rate of chicks



A pilot light was connected with the thermostat to indicate when the large heaters were on. Two 10-watt, colored, attraction lights were placed under the hover and left on all night. These were wired for manual control.

It was found that construction of the brooder offered no difficulties and that it could be built economically for 500 or 1,000 chicks. A caution for guarding against current failure should be mentioned. In case of a current outage, the construction of the brooder would cause a reversed air current which would quickly cool it. This, however, could be corrected easily by an automatic damper or by making a warm air trap above the fan.

Southern Sierras Reports New Brooders

Another fan type of brooder has been reported in process of development in the territory of The Southern Sierras Power Co., Riverside, Calif. It is manufactured by Calkins and Day, of Elsinore, Calif., and embodies not only a fan and heating elements, but a humidifying device. As illustrated, it is of the conventional shape, with the fan motor and heating elements mounted in a square metal can on the top, is equipped with pilot lamps and with a sheet metal container for water for humidifying the air when necessary. It is equipped with two extremely sensitive thermostats, accurate to ½ deg. F. temperature variation. These are mounted near the opposite sides of the brooder near the rim. Just above the curtain inside the hover is a perforated baffle sheet which distributes the air evenly. There are two heating elements, one of 1,000 watts capacity, the other of 500 watts, the larger operating only when temperatures are low and quick results are desired.

One of a battery of three fan type brooders installed on the Collins and Weeks ranch, at Bloomington, Calif., on Southern Sierra lines

Another type of brooder arrangement, utilizing an electric water heater and water pipes under a hover, has been used at West Riverside. A test run was made last March. A temperature of 95 deg. was used at the start, and gradually brought down to 70 deg. at the end of a four-week period, the thermostats operating within a 3 deg. temperature range. It operated a two-

pole magnetic switch, which in turn controlled a 5,000-watt, circulating type, Everhot water heater, which supplied hot water through pipes placed over the hover. These hovers, or compartments, each had a small electric light, were 4 x 3 ft. x 6 in. in height, and housed 125 chicks. Each opened on a 12-ft. run. The complete unit was 16 x 80 ft. A spare water heater was used as emergency only. With an average mean temperature of 57.1 deg. F., heat was required for the first four weeks only, and mortality rate percentage was 0.035, or a total of 76 out of 2,200 chicks. Consumption totaled 1,791 kw.-hr., plus 125 kw.-hr. for lighting, a total of 1,916 kw.-hr.

▼

Sterilization of Soils Electrically Is Sure

PESTS and fungous diseases in the soil in greenhouses long have been a serious problem. Apparently, the only means of elimination is the periodic application of heat. The problem is complicated further by the fact that a temperature of 180 deg. F. is required for sterilization, while any temperature much higher than 212 deg. F. kills the desirable soil bacteria and renders it useless.

All attempts to introduce heat (except with steam) have resulted in overheating the soil at the point of introduction before a sterilizing temperature is reached even a few inches distant. This is due to the extremely poor heat conducting properties of humous soil. Steam sterilizing has been practiced for many years. However, the initial cost of installing such equipment is so great that in almost all cases greenhouse operators prefer to change their soil annually at considerable cost for new soil and labor, and even then they have no assurance that the new soil is free from disease and pests.

Several months ago C. W. Wildebour of the Puget

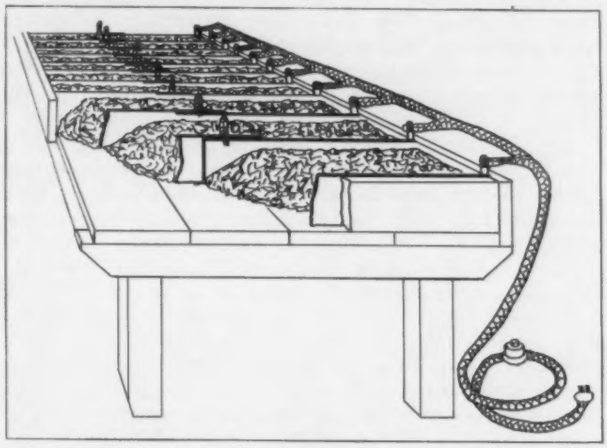


Fig. 1—Electric soil sterilizer for greenhouse benches. Plates are shown in two sections merely to indicate that the plates can be made adjustable to any size bench by lapping

Sound Power & Light Co., of Seattle, started experimenting on this problem, and he has developed the system shown in the drawings reproduced herewith.

Heat is generated in the moisture within the soil as a result of a current flow from 220 volts potential supplied through the medium of plates evenly spaced and alternately connected to opposite polarities (Fig. 1.). With plates spaced 8 in. apart, the soil at about "planting moisture," and a potential of about 220 volts, the temperature of the soil will rise from 60 deg. F. to 180 deg. F. in approximately two hours. The demand per cubic foot of soil will be 0.240 kw. at the beginning, gradually rising to 0.720 kw. at 180 deg. F.

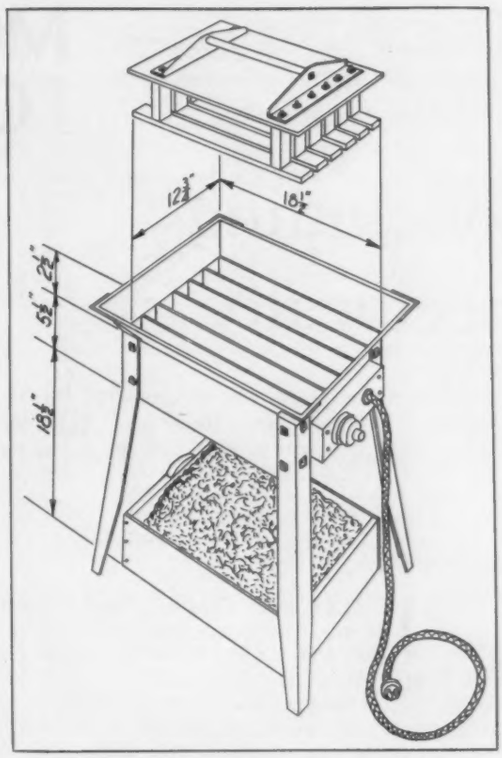


Fig. 2—For sterilizing loose soil, this device is used. Soil is placed in the hopper for treatment; when sterilization is complete, the hinged or sliding bottom of the hopper is opened to allow the soil to fall into the box. The part immediately above the hopper is used for expelling the dirt after the hopper base is opened

For sterilizing loose soil that is to be used for filling flats and pots, the device shown in Fig. 2 is used; these plates are spaced only 2 in. apart. With 220 volts and the soil at about "planting moisture," the temperature rise from 60 deg. F. to 180 deg. F. will require only four and one-half minutes. In this case the demand per cubic foot will be 3.2 kw. at the beginning and will rise to 9.6 kw. when soil temperature reaches 180 deg.

In either of the two systems, current consumption has been found to be 0.8345 kw.-hr. per cubic foot, or, expressed in terms more readily understood by the greenhouse operator, 350 kw.-hr. per 1,000 sq. ft. of soil 5 ft. deep.

If the moisture is applied 24 hours or more before sterilizing, the temperature rise will be equal throughout the entire area between the plates. The soil cannot be overheated to the point of injury as the temperature will not rise higher than 212 deg. F. at sea level and slightly lower at higher altitudes.

The cost of the equipment is very low as the plates may be of any metallic material and need only be sufficiently thick to insert into the soil without buckling.

Thoroughly satisfactory tests of this system have been made by C. F. Doucette, who is in charge of the entomology laboratory of the United States Department of Agriculture at Sumner, Wash., and by several practical nurserymen in the vicinity of Seattle.

Concluding Specifically

A Clear-Cut Summary of the Real Needs of the Industry for Fair and Healthy Distribution of Industrial Equipment

By FRANK E. BOYD

Vice-President and General Manager, Pacific Electric Motor Co., Oakland, Calif.

IT MAY seem a far cry from the subject at hand to quote from a talk given by Owen D. Young to the graduating class of Notre Dame University last year. Yet Mr. Young, in advising young men about to enter business, made fundamental suggestions that cannot help but be of interest to men already in business. His ideas apply to all business and to all branches of it, and we can do no better than to take cognizance of his wisdom in this concluding article of this series.

Speaking of the general business conditions, he said, "No upward trend can take place unless all go up. No permanency of any trend can be guaranteed unless we have sound and fair balance between all the units in our economic body."

A little further on in his talk, Mr. Young enunciated a fundamental factor in business when he cautioned the young men as follows:

"May I warn you against one thing more in entering on the serious business which you are about to undertake. Beware of slogans, catch phrases and generalities which are so prodigally scattered about with solemn manner and in unctuous phrase. In times less critical, we could accept sweeping words as the indicator of an attitude of mind and trust that, by and large, definitive progress corresponding to the state of mind would be adopted. From such general statements men were said to be conservative or liberal. Now I think we must require more. Precise and definitive statements of a policy or program must supersede ambiguous declarations and clever wise-cracks. Your science and mathematics has at least taught you that your symbols must have precise definition and that they must be used with the greatest integrity, not alone lest you mislead others, but as insurance against misleading yourself. So I suggest that you start out in this important year of 1932 by demanding clear and unambiguous statements from all who ask your support to their leadership, whether it be in the political, in the economic, or in the social field."

Mr. Young has cautioned young men to be specific. By the same token, in these articles, we have sought to be specific. In some quarters this directness and definiteness has been misread as mere complaining or as radical insubordination and disrespect. And yet the spirit in which these statements have been made has been that of the unheated, humble engineer, surgeon or scientist who cannot afford to deceive himself if the serious work in hand is to be remedial. It is time to face facts, to meet reality squarely.

Specifically Speaking

Manufacturers have said both directly and by implication that money is to be made in the selling of new motors. Motor dealers have endeavored to show manufacturers that new motors cannot be sold at a profit. In my own case I have been very specific even to the extent of presenting a complete analysis of our business. This was published in "Electrical World," April 25, 1931, and reprinted by the Association of Electragists, International, with additional data on May 15, 1931.

Likewise, the A.E.I. for several years has made national surveys of overhead cost statistics. Gathered from all parts of the country, it is surprising how accurate these averages work out for individual businesses.

Manufacturers, on the other hand, have never specifically answered the claims made in these specific presentations of facts. The situation thus affords manufacturers, in fact it places upon them the responsibility of demonstrating, either individually, or collectively through the N.E.M.A., how in fact motors can be sold at a profit. If we motor dealers are wrong, we would like to know—specifically.

Our contention has been that the gross margins on any product sold, whether motors, lamps or wiring, should cover, in addition to the sales expense itself, also a fair share of the expense of management, receiving, shipping, warehousing, losses due to bad accounts, taxes, insurance, water, light, heat, and telephone, rent, office supplies, automobile, advertising, dues and entertaining and miscellaneous.

The issue should not be confused by expecting the dealer to break down his costs of selling individual items beyond a reasonable point. In all small businesses, even as in large businesses, a point is reached beyond which too fine a breakdown becomes meaningless.

Motor dealers occupy a definite and sound position in industry as a medium of service to the consumer and to the manufacturer. If this were not so they could not have survived the depression. The motor dealer's business is built on a foundation of large and diversified regular clientele. Those who want his services must remember that, like themselves, he is in business for a profit. While, no doubt, specific instances can be shown of dealers having sold for cost, this is not peculiar to the contractors. If such selling were the rule, contractors could not acquire an average gross margin, for all operations, of 23 per cent or more, as shown in national figures.

While there has been a trend toward the sale of motors direct-connected to machinery by the machinery manufacturer it may be found, as a result of this depression and the need for manufacturers and wholesalers to reduce their own costs of doing business, that the motor dealer can be of more value as a medium of sales and service than in the past.

In the matter of direct sales of equipment and operation of service shops, manufacturers and wholesalers have frequently pointed out to their friendly dealers that they do not solicit business from that par-

Overhead, as Mr. Boyd Sees It

In my business we charge varying amounts of the total overhead to each department. We do not expect every department to operate under our general average overhead. The following table shows how the gross margin and the overhead of each department compares to net sales of each department:

ALL DEPARTMENTS

	% Gross Margin of Net Sales	% Overhead of Net Sales
1929	28.0	23.25
1930	30.7	29.40
1931	31.1	37.2
1932 (10 months)	30.8	30.6

WIRING DEPARTMENT

	% Operating Margin of Dept. Sales	% Dept. Overhead of Dept. Sales
1929	27.7	16.8
1930	29.8	22.6
1931	31.9	36.5
1932 (10 months)	31.0	30.2

SHOP

1929	41 8	36.6
1930	38.4	37.0
1931	37.5	41.1
1932 (10 months)	39.4	37.9

SALES DEPT.

1929	20.8	25.8
1930	26.1	33.8
1931	24.4	36.0
1932 (10 months)	25.5	26.8

In a small business it is not practical to break down costs further as a regular accounting practice. However, I have made a study of sales department expense allocated according to the following groups: used equipment—including motors, control, switches and transformers; supplies—including wiring devices, pulleys, repair parts, lamps; new equipment—including motors, control, transformers, heating equipment, portable tools. From this we have found that the actual overhead in per cent was practically the same for each of the three groups.

This being the case, it follows therefore that the used equipment and supply sales are supporting the sales department, because the gross margin on these two groups exceeds the overhead. The gross margin on new equipment is less than the overhead, therefore a net loss is involved. The net loss on new equipment is sufficient to drag the entire sales department into the red as the table clearly shows.

Is not this the answer to the dealer's lack of interest in the sale of new equipment?

It cannot be contended fairly that our overhead may be too high. If this were so we could not operate our general business in the black in 1932 with such restricted markets as prevail. In the final analysis, competition and the ability of management to operate a business over a period of years in the black determines whether or not the overhead is practical and reasonable.

ticular contractor's customers. But in the same breath they unwittingly make a point of the fact that they confine their solicitations to customers of dealers handling competitive lines. In this they fail to see that with each manufacturer and wholesaler doing this, and with many in the field, there is a complex crossfire which destroys the whole commercial structure. This is a matter worthy of the attention of the N.E.M.A., the N.E.W.A., and possibly even of our own P.C.E.B.

Perhaps the general use of the phrase "motor dealer" is a cause for misunderstanding. Even among the better grades of motor dealers, sale of new motors and control accounts for only approximately 10 to 20 per cent of their total business. The story which I have been trying to tell is much more far-reaching and will have a wider application as the industry develops new products and devices. Our problems involve supplies, lamps, lighting equipment, repair parts and numerous other products besides motors and industrial control. It includes industrial heating, photo-electric relays, oil switches, transformers, cable, electric tools, pulleys, pumps, welding equipment, in fact all of the diversified electrical equipment for industrial application.

Now, to be specific in this concluding article as to what can be done by manufacturers, we submit the following:

1. Restrict the number of dealer outlets in each community to a number consistent with available business.

2. Provide all manufacturers with outlets. The small manufacturer should be accorded an opportunity of getting representation. The large manufacturer should restrain the impulse to monopolize all the channels, if for no better reason than to provide for stability in his own business.

3. Arrive at an agreement as to what services each branch of the industry should perform.

4. Classify business intelligently according to the logical channels and keep this classification consistent between the manufacturer and the wholesaler.

5. Establish discounts on all products, based on the costs of doing business and a fair net profit.

6. Establish dealer helps based upon a study of distribution.

7. Establish a joint policy forum with representatives for each branch of the industry so that the benefit of practical experience can be transmitted to manufacturers before new policies are formulated.

To amplify the matter of distribution being afforded the small manufacturer, this can be said: While the large business firms have contributed much to the industry through large accumulations of capital, through engineering and research and development of production methods, and have done much in general promotion, one unfortunate evil accompanies this beneficial work. That evil finds itself expressed in the aspirations on the part of executives and employees to do a superjob and unwittingly to deny small competitors a share of the business. As long as individuals possess ingenuity and resourcefulness, the small competitor will meet the situation as best he can. This results in expedients which very largely destroy the recognized and economically sound avenues of distribution. The larger interests in manufacturing must deny themselves the ambition to possess all of the good outlets. They must concede and accord to small competitors a fair share of distribution mediums.

Wholesalers apparently do not consider it their function to give the consumer day and night service, to rent and repair equipment, do the engineering or other numerous services that it is a dealer's function to perform as the outpost of the industry.

Yet if dealers are to be the proper channel in the industry so to serve the consumer, the wholesaler must face the responsibility of protecting the dealer to the extent that he can better perform the functions expected of him. Wholesalers, too, must practice a measure of restraint and refuse to sell to many who, on one pretext or another, claim the right to wholesale buying. Dealers cannot maintain adequate, presentable or strategically-located places of business in the interest of the industry and consumers if wholesalers persist in selling direct to buildings, industrials and many of the so-called "carpet-baggers." A constructive attitude and consistency seem to charge wholesalers and manufacturers, through their national associations, with the establishment of uniform classifications of trade and sales policies.

Might it not be profitable to the N.E.M.A., likewise N.E.W.A. and N.E.L.A., to establish departments of dealer relations in the interest of seeking means of making dealer business profitable, and to recognize thereby that it is through profits rather than catch phrases and slogans that dealers will be stimulated in their sales activities? Also, by this profit, they may attract better men into dealerships, better business heads, better representatives of the industry and interpreters of the industry to the public.

Again quoting from Mr. Young's speech, it is interesting to observe that in his advice to the students entering business he said of those of us now in business, "at best, they have an allotted time of three-score years. Nearly half must be used to develop their powers to the point of effective action. Then perhaps only fifteen or twenty years remain in which to succeed or fail. So to them the time factor . . . . is important. . . . . so naturally you will find, as you go out tomorrow, great consternation and unrest among these men and women with whom you have to work."

The significance to us, in Mr. Young's thoughts, lies in the fact that we must have our profits now while we live. The industry has failed to see this and to recognize also that we are going to ask for profits while we live. If we cannot get them from certain items, human ingenuity and resourcefulness will cause us to turn to or to develop other ways and means of making money. This has been so in the past and will be so in the future. There is no threat intended in this statement. It is a plain statement of economic law.

We dealers should have pointed this out to manufacturers, wholesalers and central stations more insistently and more emphatically before. Because we have not made this clear, we have brought upon ourselves the criticism that we do not know how to sell, whereas the real fact is that business judgment has caused us to refuse to sell. We can and we do employ capable and adequate salesmen and engineers for those lines or activities which profits justify. We can do a bigger and better job for the industry just as soon as and no sooner than recognition of this law is given in the margins afforded us.

Dealers

Now to be specific in regard to the dealers: There are other ways in which the dealers have also been responsible for much of their own difficulty. Some of us have been so jealous of competition that, if we could not get certain pieces of business, we have quoted prices so low that no one else could get the business at a satisfactory margin. This is the great evil of competitive bidding. It argues for extraordinary effort to change our entire business emphasis to the development of new and original business on a non-competitive basis. This can be done only through the medium of selling up our services and ideas to our clientele, an activity which other branches of the industry would probably welcome.

The lack of respect in which many in the other branches of the industry hold the contractors is of our own making. As explained in the preceding article, it probably is largely due to continuing to be "men with plyers," with noses so close to the outlet box that we do not acquire a broad enough perspective of the industry and of our own peculiar functions in it.

The situation is not hopeless. Personally, I have been impressed, since leaving the ranks of the manufacturer to become a contractor, with the fact that there are an ever-growing number of truly good business men in our ranks. Our businesses are small, but they possess all the elements of large corporation activity, with the advantage that we should more truly be able to see in the palm of our hand, figuratively speaking, our opportunities and our problems than is possible for our big brothers whose operations are so complex and high pressured that it is difficult for the minds of men, capable though they are, to get a fair and adequate perspective.

The trade policy committee of the National Electrical Contractor's Association has well summarized what we should address ourselves to in the interests of harmonizing and developing the industry. These proposals deserve the thought and the action of all branches of the industry today as never before in the whole history of distribution.

While at times we have been outspoken and critical of the diverse problems confronting us, I would like to say that I am not unmindful of the many years of loyal and sincere contributions made to the industry by numerous individuals and firms leading the activities of the other branches of the industry. They are responsible for the fact that the lot of each branch is measurably better than it was years ago.

We can all be thankful for the unselfish and untiring efforts such men have given to the industry. But we must approach the problem still confronting us, together, with the same idealism and unselfishness and optimism as exemplified by the activities of these old timers.

Editor's Note: While this is the last article in this series of studies on the economics of motor distribution, articles of which appeared in the Jan. 1, April 1, May 1, June 1, Sept. 1, and Nov. 1 issues, it is hoped that this will not be the last of discussion on such problems in these columns. The expressions of other motor dealers, wholesalers, manufacturers or central stations on these fundamental issues of distribution earnestly are invited. The Motor Forum will still continue to be a forum, accessible to anyone in the industry with intelligent comment to make.

▼

Portable Unit for Farm Pumping Use

By W. R. NEWMYER
Rural Service Agent,
Portland General Electric Company

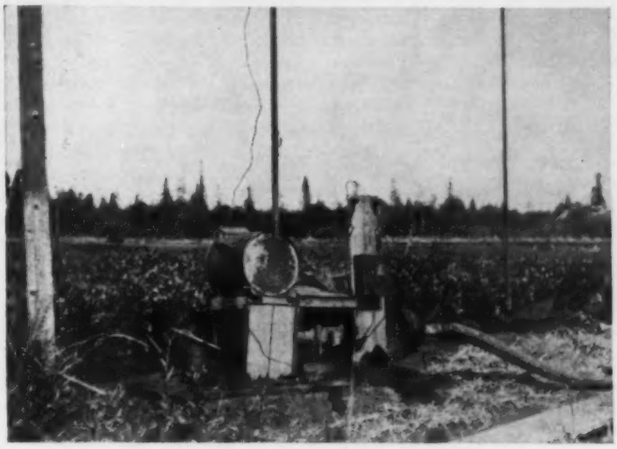
IRRIGATION through the use of a portable electric pumping unit has proved highly successful on a tract of land north of Salem, Ore. Originally the bottom of a lake formed by a beaver dam, this tract was drained by dredging a ditch down the center, the reclaimed soil being especially suited to truck farming. Each small farm averages about 20 acres and by intensive fertilization and irrigation, tenants are able to produce two crops a year, creating an income as high as $3,000 per acre.

Until recently irrigation was accomplished by gas-

engine-driven pumps. The first two farms converted to electric pumping presented no unusual problems as these farms were piped for irrigation.

With the remaining farms substitution of electric motors for gas engines proved more difficult as these farms were cut into plots averaging 10 acres with irrigation ditches on three or four sides. When water was required a portable gas-engine-driven pump was moved to the lotion and pumping was done from the laterals around the plot. From the farmer's standpoint, the portable unit was highly desirable as it eliminated the necessity of piping the entire farm with 2½- to 4-in. pipe for irrigating purposes. This fact made the electrification costs seem prohibitive until the following idea was evolved.

Portable electric pumping unit on Jim Yada's farm at Salem, Ore.



Two No. 4 B & S gage, hard drawn, bare copper wires were strung along one of the ditches. These wires are supported on 25-ft. poles spaced 150 ft. apart. The line is served at 220 volts through a transformer mounted on the first pole of the run. Power was then available for a portable electric-driven pumping unit. This unit consists of a single-phase motor driving a centrifugal pump mounted on a small wooden sled together with a fuse starting switch for the motor. Two 15-ft., 1x1-in. sticks were fitted with a small spring clip at one end. From these clips No. 8 rubber covered wires lead to the switch contact. As the leads are attached to the upper end of the poles only, an operator can stand slightly to one side and not be in contact with the wires when connecting the clips to the overhead conductors.

Since its innovation, this scheme has been so successful that several farms have been so electrified and the electric unit still continues to displace the gas-engine-driven pump in this area.

Aside from the irrigation load which has been added, the application of electricity in this manner has paved the way for further utilization on these farms. Soil heating for seed propagation is being experimented with and promises greater load-building possibilities than irrigation in this area.

▼ ▼ ▼

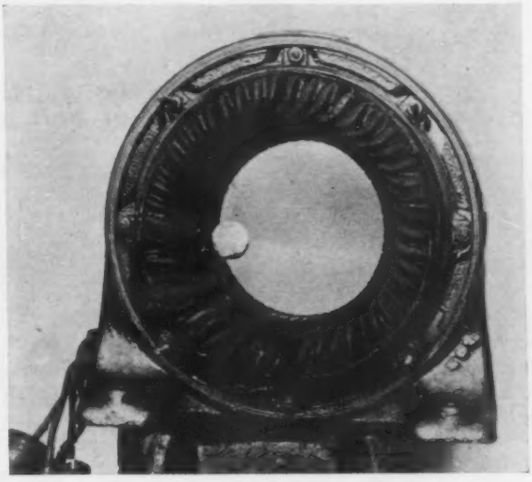
Another Test for Rewound Stators

IN THE course of efficient repair work, defects in stator windings after rewind or repair occur too infrequently to justify any appreciable time being spent in preliminary tests before the final assembly of the complete machine. On the other hand, when a fault does happen to exist it can be corrected more easily and in less time if it is detected before the winding has been dipped and baked. Also, there may be occasions when all of the parts of the motor have not been sent to the shop, for one reason or another, and hence a final running test of the machine, which is always desirable before it is returned to service, is not possible.

By employing the action of the revolving magnetic field upon a metal ball, however, a novel scheme for testing stators becomes practicable. The advantage of this test is that the time involved is within such negligible limits that it becomes good insurance to test all stators in this way before they are passed on to the impregnating operation.

In order to make this test, it is necessary only to apply full, or nearly full, rated voltage to the stator winding terminals and to toss a metal ball into the field. A steel ball about an inch or so in diameter, such as those used in tractor bearings, answers the purpose. It will follow the revolving magnetic field and roll unwaveringly in a circular course around the stator bore, providing there are no errors in the stator connection or short circuits in the winding.

Observation of the performance of the ball, by which faults can be detected, is simplified by the circumstance that the ball will not travel at the full speed of the rotating field, but will lag to a great extent. A ball 1 in. in diameter will make about 150 r.p.m. in a stator bore



Movements of a steel ball in the stator bore constitute the test

10 in. in diameter when the speed rating of the machine is 1,800 r.p.m. and full voltage is applied.

A shorted coil can be detected by a marked hesitation of the ball to pass the slot in which the fault is located. A single reversed coil will cause a similar effect. Reversed poles or other connection errors of a like nature produce a more pronounced effect and when they exist the ball usually will freeze to the stator iron and refuse to roll at all.

It is not necessary to place the stator in any particular position to make the test. Results are equally satisfactory when the stator is in an upright position, a horizontal position or any angular variation of either. It is necessary only to apply the current to the winding terminals as the stator sets on the work bench and to toss the ball into the field.

National and State Elections Affect Electrical Industry in West But Little

WHEN the Democratic party swept into overwhelming victory in the November elections, it was the signal for wholesale rereading of the party platform, especially those sections relating to power and public utilities. Long the "liberal" party, as contrasted with Republican "conservatism," the Democratic party has espoused public entry into the light and power business. But just how far, and in what direction, were moments of concern.

President-elect Roosevelt's declarations at Portland, Ore., were publicized widely. (EWEST, Oct. 1, p. 168.) And although some interpreters hailed the eight points as "radical and forward," spokesmen for the utilities have said that "they are no more than the practices of every self-respecting power company today."

From past legislative history, it appears certain that two steps will be taken by the incoming administration: a tightening of the reins on private utilities, especially on holding companies, and government operation of Muscle Shoals. Governor Roosevelt's action on the St. Lawrence waterway problem, which provides New York with state-owned power, makes the latter appear inevitable. The actions of the Federal Power Commission and the general public indignation at the Insull failure would have brought the first regardless of which party was in power.

Significance of Election In Washington

Of immediate interest are the results of the elections in the Western states. In Washington, the next governor and the incoming senator will be Democratic. The governor, Clarence D. Martin, at a party dinner soon after the election, uttered two significant thoughts. The first was that "the time has come when we must tax according to the ability to pay." The statement went uninterpreted. The second dealt specifically with the industry: "I want the people to have telephone, light and power service in the maximum amount at the minimum rate. Instead of waiting for developments, I propose an investigation so that we may know definitely what is going on."

However, proposals to create power districts, which were before the voters in five counties in the state, were defeated by wide margins in four counties: Whatcom, Island, Snohomish and Skagit. In the fifth, Pacific, the legality of the election was questioned and a restraining order obtained to prevent the canvassing of the ballots. The Grange power bill for the district northeast of Spokane carried nearly five to one and the commissioners propose to erect lines to serve the farmers.

Oregon Water Power Amendment Passes

An amendment to the Oregon constitution permitting state development of water power passed by a safe margin. The amendment (EWEST, Aug. 1, p. 79) strengthens the present policy of the state in ownership and control of the development of its water power resources. In 1930, a first amendment was passed to allow the creation of the utility districts; the present act was sponsored by the state's Grange as an additional aid to the financing and forming of those districts, but, to date, all proposed utility districts have been defeated at the polls or ruled illegal by the courts. The only such measure before the voters this time was in Hood River county, but it was defeated by an unfavorable vote in the city of Hood River. So far, the extraordinary debt-creating powers granted by the 1930 amendment have not been put into use.

Utility Commissioner Is Utah Governor

In Utah, a former member of the state public utilities commission, Henry H. Blood, is governor-elect. With substantial property interests in the state, he has for years been closely identified with public affairs. So far as is known, he never has exhibited a spirit of antagonism toward the light and power industry.

The present governor, George H. Dern, a mining engineer with extensive mining interests, has been advanced by political writers as the probable and most logical candidate for Secretary of the Interior in the next cabinet. As such, he would hold a powerful position with regard to water resources, the same as does present-Secretary Wilbur, and would be in direct charge of Muscle Shoals, Hoover Dam and similar developments.

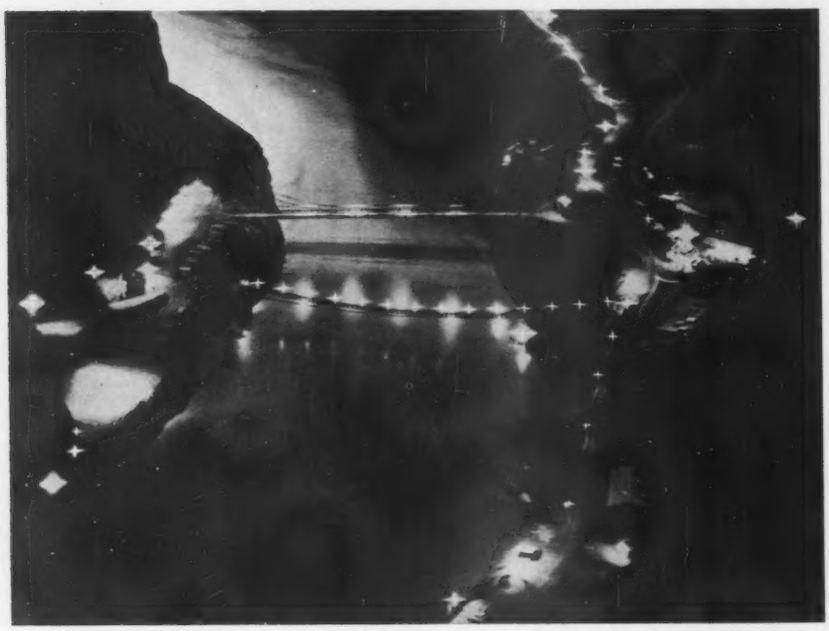
California Quiet

California thought little about power in the past election, except in Los Angeles where four out of six amendments advanced by the board of water and power commissioners were approved. They provide permission for the commission to borrow unlimited sums for terms up to 12 years; to borrow from federal and state governments; to use considerable discretion in allocating its funds, especially revenue funds; the fourth is a term clarification measure.

William Gibbs McAdoo, senator-elect from California, during his campaign did not mention specifically any personal power platform. He did, however, reiterate the party platform and may be expected to be guided by that. Because of his national prominence, he

▼ ▼ ▼

A Year Ahead of Schedule



WHEN, last month, a year and a half after the contract for construction of Hoover Dam was let to Six Companies Inc., the waters of the Colorado River were diverted into the four 50-ft. tunnels, work on the project was a year ahead of schedule. Work now is progressing on the coffer dams which, when finished will insure uninterrupted attention to the main dam. The two spillways, involving excavation of 600,000 cu. yd. of rock, have been completed and are ready for lining. Such progress as this required a 24-hour working schedule, made possible by the lighting facilities shown.

may play an important part in the Senate, and his convictions are important. It will be remembered that he was the director-general of railroads during the war, and as such he was head of the first large-scale government attempt to run an industry.

So far as is known, no important problems relating to the electrical industry were settled in other Western states.

▼

P.G. and E. Calls Off Public Service Deal

Because Pacific Gas and Electric Co. objected to conditions imposed by the Railroad Commission in its conditional approval of the sale of Pacific Public Service Co., officials of the former decided to cancel the proposed deal. The only statement was:

"Upon careful consideration of the Railroad Commission's decision, we have decided not to go forward with the acquisition of the Pacific Public Service Co."

Terms for the sale of the Standard Oil Co. subsidiary had been placed before the commission (EWEST, Aug. 1, p. 78) and had been under examination by that body for some time; sanction finally was given, with certain conditions:

1. P.G. and E. was to file a satisfactory resolution by its directors agreeing that, prior to issuance of new stock, it would transfer $5 millions from "unappropriated surplus" to "appropriations for additions and betterments."

2. P.G. and E. was to agree to claim no right to issue stocks or evidences of indebtedness against this $5 millions unless earnings of Pacific Public Service were sufficient to pay annual dividends on the $8,841,200 of stock.

3. P.G. and E. was to agree to accumulate a surplus of $5 millions from earnings or sale of properties at a price in excess of that paid for their control.

4. The $5 millions referred to was to be carried under "appropriations for additions and betterments" until the commission authorized its transfer to another account.

▼

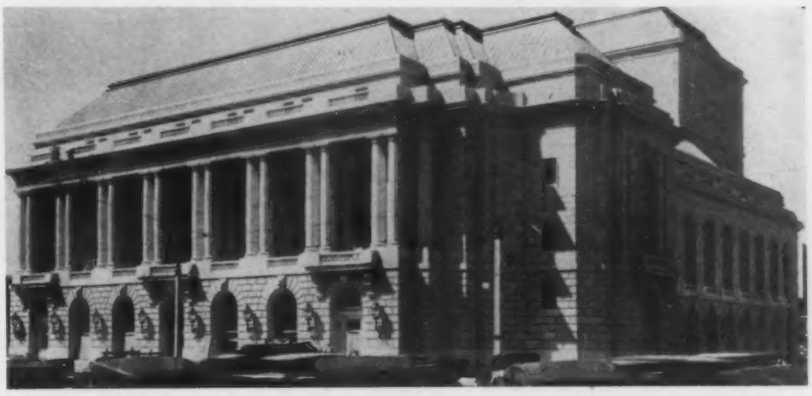
Northwestern Halts Rate Cut With Injunction

Preliminary hearing on the suit brought by Northwestern Electric Co. against the reduction order of the public utilities commissioner (EWEST, Sept. 1, p. 120, et seq.) resulted in a temporary injunction being granted Nov. 4. It was shown that doubt existed regarding the value of the Oregon properties of the utility as allowed by the commissioner. The case will go to trial when affidavits and briefs have been filed.

Ariel Costs Scrutinized

Hearing on the Ariel project of Inland Power & Light Co. were begun during the month by the Federal Power Commission, sitting in Portland. Information desired is the date on which operations were started and the exact cost of the project. Oregon Utilities Commissioner Thomas said the hearing was requested in connection with a complete investigation of Northwestern Electric Co. and its affiliated organizations.

San Francisco War Memorial Opened



Composed of two buildings, with identical exteriors, San Francisco's War Memorial, built by public subscription at a cost of $6,125,000, not including city donated land, was thrown open to the public during the past month. The opera house, shown, is at the left and the Veteran's Building is at the right of the group. Widely acclaimed as being the finest of its kind in the country, the opera house contains more than a million watts in lighting, controlled from a 30-ft.-long switch board. Arthur Brown, Jr., was the architect of the group, Leland & Haley were the mechanical engineers and Robert L. St. John was the electrical engineer

▼

Western Expenditures To Exceed Half-Billion

Ponderously but effectively, federal, state, municipal and private agencies are mobilizing for a final thrust at current economic conditions. National in extent, this drive is intended to supply industry with a momentum which will insure its gradual acceleration to normal operating speeds.

Funds made available by Reconstruction Finance Corp. have been augmented by the response to efforts of the Committee on Industrial Rehabilitation and Modernization to obtain immediate action on necessary construction, repairs and maintenance in state, municipal and private organizations.

In the eleven Western states, projects for which definite commitments have been made involve the expenditure of over half a billion dollars. As reported to ELECTRICAL WEST, the total is now $582,966,500, a figure which probably will be increased substantially upon receipt of complete information from all districts.

Included in the total are such projects as Hoover Dam, the Metropolitan Water District, and the two San Francisco Bay bridges, expenditures for which will be made over a period of several years. Also included is $18,118,750, a figure representing the commitments of private industry to date for its rehabilitation program. From the accompanying tabulation, it is evident that the expenditures will be diversified sufficiently to have far-reaching effects in permanently improving the business situation.

Project	Amount
Hoover Dam	$165,000,000
Metropolitan Water District	220,000,000
San Francisco Bay Bridge	75,000,000
San Francisco Golden Gate Bridge	35,000,000
Yakima Irrigation District	12,000,000
Los Angeles Flood Control—	
San Gabriel Dam No. 1	10,000,000
Pasadena Water Supply	7,000,000
San Diego Water Supply—	
El Capitan Dam	4,000,000
Los Angeles Federal Building	5,000,000
Los Angeles Dept. of Water & Power—Boquet Canyon	4,000,000
San Francisco Federal Bldg.	2,500,000
Ordway (Colo.) Water Supply	2,000,000
City of Seattle Water System Improvement	1,491,000
San Francisco Marine Hospital	1,000,000
Miscell. Building Projects—	
Federal Bldgs. $1,267,750	
Municipal Bldgs. 1,065,000	
Small Water and Power Projects. 2,174,000	
Private Buildings. 6,300,000	10,806,750
Industrial Projects—	
P. G. and E. Co. $5,000,000	
So. Calif. Edison 1,300,000	
L. A. G. and E. Co. 1,250,000	
So. Calif. Tel. Co. 1,000,000	
Gen. Pet. Corp. 1,500,000	10,050,000
Rehabilitation projects of 92 industrial plants	18,118,750
Total expenditures for the eleven Western States	$582,966,500

▼

SAN FRANCISCO WAGE SET—At a meeting of the Impartial Wage Board of San Francisco, the prevailing wage scale for 1933 was established. The wage for journeymen electricians was set at $8 per day, a scale which has been in effect for several months as a result of a voluntary reduction on the part of both electricians and contractors and with the approval of the Industrial Association. The 5-day week, another unofficial schedule, was given official status by the board.

Utah Power First-Aid Team Wins

The first-aid team of the Salt Lake division, Utah Power & Light Co., took all trophies in sight at the Utah Safety Society first-aid contest in October. Eighteen teams competed, representing industrial institutions of the state, but the power company team won first places in the public service division, in a special contest covering artificial respiration, and in the grand sweepstakes for the highest rating in the field. The team had a percentage of 99.75. Members (left to right) are: C. F. Grant, Ralph McCloy, R. T. Williams, J. B. Gill, A. L. Hendrickson, J. A. Saxsey and Earl Hewitt, captain

▼ ▼ ▼

Edison and Los Angeles Bureau Sign Pact To Abandon Wilmington Plant

SOUTHERN California Edison Co. Ltd. and the Los Angeles Bureau of Power & Light have effected a contract whereby the bureau's projected Wilmington steam plant (EWEST, July 1, p. 35, et seq.) will be abandoned, the bureau's purchase price of Edison power will be reduced and the two will work together to bring in Hoover Dam power. The contract was ratified by the city council and water and power commission on Nov. 2, and by the state railroad commission a week later, ending a lengthy fight in which the power company sought a court injunction against the steam plant. Harry J. Bauer, chairman of the Edison board, also said that his company would withdraw its opposition to the commission's plans for financing the transmission line to Hoover Dam and to a number of city charter amendments easing restrictions on borrowers (see p. 244).

The agreement itself is a modification of a 20-year purchasing contract whereby the bureau buys energy from the company. It provides that neither shall construct additional producing facilities until the present facilities are used to full capacity, meanwhile one supplying the deficiencies of the other; that beginning in January, the cost of power bought by the bureau shall be reduced 6 per cent, and reduced 15 per cent the next year; that the retroactive features of the demand charge or peak load feature of the purchasing agreement be eliminated upon the introduction of Hoover Dam power; that upon the introduction of dam power the bureau will use the Edison company's Long Beach steam plant for stand-by purposes; that emergency service will be rendered; that for mutual benefit, each will generate or transmit Hoover Dam power.

Set up as the annual rental charge for the use of No. 9 unit at Long Beach is a figure of $575,000 plus actual cost of fuel. Though the commission estimated that the contract would save the city $2 millions within the next three years, E. F. Scattergood, chief electrical engineer of the bureau, pointed out that reduced rates to consumers cannot be anticipated pending the repayment of borrowings from the Reconstruction Finance Corp. for the construction of the Hoover Dam line.

▼

Utility Commission Denies P.G. and E. Rate Cut

Petitions for a reduction of the electric rates of Pacific Gas and Electric Co. were denied last month by the Railroad Commission in a decision which disposed of cases dating as far back as 1925. The reduction had been asked by several cities and organizations in northern California (EWEST, Nov. 1, p. 207), but the commission decided that the prospective earnings of the company did not justify an order reducing the charges.

Reviewing the case from its inception in 1925, the commission pointed out that it had ordered several cuts since that date, aggregating a reduction of $6 millions per year.

"Using the lowest rate base suggested and the highest estimate of the amount available for return," the decision read, "it appears that for the year 1932 the consolidated companies will earn a return of less than 6.9 per cent on their electric operations." This was not considered too much in light of the downward trend of revenue.

Coast Counties Cut Ordered

Interim rates for electric service of Coast Counties Gas & Electric Co., affecting an annual saving of $40,500 to consumers, were ordered by the railroad commission following its investigation last month. At the same time, the commission directed the company to cut approximately in half the management and engineering fees paid Standard Management and Operating Corp. A petition for rehearing was denied.

Effective Dec. 1, the new rates mean reductions of 6 per cent in general lighting charges, 5 per cent on street lighting, 4 per cent on domestic service, 4 per cent on general power service and 3 per cent in agricultural charges.

▼

Ross Dissatisfied With R.F.C. Proposal

J. D. Ross, Seattle City Light superintendent, expressed his disapproval of a loan of $1,650,000, semi-officially approved by Reconstruction Finance Corp., and will make another trip to Washington, D.C., to ask a minimum of $3 millions. Originally, $7,700,000 was asked. Mr. Ross declared that the small sum would be sufficient only to complete the Diablo power house and build a transmission line from the plant, but would provide nothing for extensions in the city.

Bridge Planned For Seattle

Elbert H. Chandler, who heads a syndicate which proposes to build a bridge across Puget Sound, will make immediate application to the R.F.C. for a loan of $3 millions, it was asserted. The bridge will have a central span of 1,200 ft., will be three-quarters of a mile long.

▼

Initial Aqueduct Contracts Awarded

Contracts for construction of 75 miles of power supply lines and substations to be used in connection with building of the Colorado River aqueduct by the Metropolitan Water District of Southern California were awarded Nov. 22 by the district board of directors. Total amount of the contracts is $200,499. The work to be done under the accepted bids includes construction of 45 miles of 66,000-volt transmission line, 30 miles of 33,000-volt line, with the installation of substations and transformers. The lines are to be used for the transmission of power from Colton, Calif., to points along the aqueduct line during construction. Electrical energy for pump-

ing after completion of the aqueduct will be furnished from Hoover Dam.

Quality Electric Co., Newbery Electric Corp. and H. H. Walker, Inc., all of Los Angeles, were awarded a joint contract for construction of the line and the substations. Their bids of $42,785 on the transmission lines and $48,414 on the substations were the lowest bids.

Other bids accepted included: Charles R. McCormick Lumber Co., $14,180.50 for cedar poles; Joslyn Company of Calif., $2,580 for pin type insulators; H. H. Walker, Inc., Newbery Electric Corp. and Quality Electric Co., $6,360 for hauling; J. H. Baxter & Co., $8,255 for treated poles; Westinghouse Electric & Mfg. Co., $12,180 for suspension insulators; Anaconda Wire & Cable Co., $44,800 for copper conductors; Phelps Dodge Copper Products Corp., $21,400 for copper conductors.

▼

Oregon Committee Studies Municipal Utility Tax

"To tax or not to tax" municipal utilities in the State of Oregon was made the subject of a public hearing in Portland Nov. 17 by the interim committee of the legislature, appointed at the last session by Governor Meier to study this question. No advocates of the proposition that municipal utilities should be taxed appeared at the hearing, but many believers in and representatives of organizations favoring municipal ownership of light and power properties were present to voice protest.

Facts bearing on the subject, previously collected by the committee and brought out at the hearing, indicated that eight municipally-owned power systems in the state have a value for assessment purposes of approximately $2 millions, and that municipal water systems have a total assessment value of $21 millions. The committee found that 52 out of 114 municipal utilities of all classes had a net surplus of revenues over expenses sufficient to pay taxes if levied as upon private property.

One unique theory was advanced: that not only should municipal utilities not be taxed, but that private light and power utilities should be exempt from taxation so that rates could be reduced.

The committee offered no decision, but stated that it would be ready to report within a few weeks. It is charged with the duty of reporting to the next legislature to guide that body in any consideration it may give to the subject.

News Shorts

¶ FEDERAL Power Commission has authorized Puget Sound Power & Light Co. to issue $10,500,000 in securities, including $7,500,000 of first mortgage and refunding mortgage 6 per cent gold bonds, due 1950, to be used as collateral.

¶ METROPOLITAN Water District may go ahead without fear, the taxpayers' suit filed in the District of Columbia Supreme Court (EWEST, Oct. 1, p. 167) having been dismissed on Nov. 8.

¶ GLENDALE, Calif., city manager and comptroller will report on proposal of mid-western syndicate to finance and build a municipal generating plant for the city, capable of producing 55,000,000 kw.-hr. annually.

¶ PASADENA, Calif., will place a new 32,500-kw. steam generating unit into service early this month. This brings the station capacity to 60,000 kw.

¶ CRESTON, B.C., will have a $40,000 hydro plant by spring, indications are, and officials of Creston Light, Power & Telephone Co. are developing 200 hp. initially.

¶ PUBLIC Service Co. of Colo.'s major 1932 construction project, 3,000-kw. Grand Valley hydro plant, will go on the line for preliminary tests sometime this month.

¶ KPO, San Francisco, key station of NBC's Pacific network, has started work on its new 50,000-watt transmitter, should be finished by April 1, 1933. Columbia Steel Co. is erecting the three 300-ft. steel towers.

¶ PUBLIC Service Co. of Colo. sold $30,000 in appliances and merchandise in one day, Nov. 13, its annual anniversary sale. Every item was discounted 10 per cent that day only.

¶ COLORADO Electrical League again will sponsor a Christmas home lighting contest in Denver this year. Discontinued last year, results were poor, so revival was sought by businessmen and public. Denver's "Post" cooperates with publicity.

P. C. E. A.

Industry Meeting Extends Exposition

An added day of public exhibition of the Home Appliance Exposition has been announced by R. E. Fisher, vice-president in charge of public relations and sales, Pacific Gas and Electric Co., in order to bring the electrical industry dinner and the meeting of the board of directors of the Pacific Coast Electrical Bureau within the big industry event. The exposition, instead of being open to the public only on Dec. 13 to 15, will remain open Dec. 16, also. The directors' meeting will be held that day and the big electrical industry dinner that evening at the civic auditorium in San Francisco.

Later developments of the P.G. and E. exposition are a plan to hold similar expositions on a smaller scale in each of the division offices during the month of December; a special dinner given by A. F. Hockenbeamer on Thursday evening, Dec. 15, to company salesmen who have made their quotas, and the private sales convention of the P.G. and E. Co. on that same day. To the latter every gas and electric salesman in the system will be brought, together with the entire headquarters staff of each division, including superintendent, chief clerk, accountant and others in the operating as well as the sales end of the business. Following the San Francisco sales meeting, each division is to call a complete employee personnel meeting to set forth the quotas and sales plans for the forthcoming year and the part each employee must play in its success.

The details of the sales convention have been intricately worked out by

▼ ▼ ▼

Toasting Vallejo's Electric Progress

Hosts of the day:
R. C. Bragg
Albert Casper

WHEN the Vallejo (Calif.) Electric Light & Power Co. dedicated a new substation to the service of that city last month, local Rotarians and San Francisco engineers were guests at a luncheon in the substation yard. The usual "fried ergs and hot watts" were not on the menu.

Before the luncheon, the guests inspected the new installation and the company's original generating plant, taken out of service in 1906; this pioneer equipment was in marked contrast to the modern design of the new installation. During the luncheon, speakers reminisced about the good old days when "you opened a line with a shotgun."

H. M. Crawford and his staff, the only details of which they would give out being that it would concern itself with the "why, what and who" of the sales program for 1933.

Participation by manufacturers and distributors in the big appliance exposition is exceeding all expectations and it promises to be a most unique show in that there will be no cooking schools, no special entertainment features and that the appliances will be displayed in groups rather than in individual exhibitor's booths.

▼

Commercial Section Work For Year Outlined

In the absence of the former period allotted in a general session of the Commercial Section conclaves for a report from each bureau chairman as to the objectives of the committees under that bureau for the year, ELECTRICAL WEST summarizes briefly these plans as reported to the executive committee of the section after the last conclave.

Merchandising Bureau

JOHN WRENN, Chairman

The air heating committee plans further study of insulating materials, cost studies into the economics of air heating load to the utility, coordination with the air conditioning committee with respect to heating as a part of air conditioning, and follow-up of the P.C.E.B. advertising of air heating in "The Ideal Electric Home" booklet.

The water heating committee plans study of the application of water heater rates to wattage control, or off-peak water heating. The range committee plans to coordinate with the activities of the Electric Cookery Council, especially to concentrate on selling employees ranges, to study methods of changing the seasonal nature of range sales, to determine the feasibility of speeding up or modernizing old ranges with new fast elements, to study the junk and trade-in problem.

The air conditioning committee will concentrate on developing the field for small-capacity or residential-type of units, and go into the matter of ice or compressor installation advantages.

The appliance committee recommended that utilities establish crews to make appliance surveys and advise on new appliances. This was rejected by the executive committee as infeasible. The appliance committee, however, will seek to develop the technique for cooperative home laundry schools and promotional drives to be operated by the P.C.E.B. as a joint industry work. The refrigeration committee will act as a clearing house between the various refrigeration bureaus, exchanging ideas and plans between them. It will also prepare sales data for the proposed N.E.L.A. sales manual.

The radio committee will undertake an elaborate load study to determine the effect of program upon load, determining from load meters on substation feeders at particular times what effect time and character of program have on lighting load.

Power Bureau

W. H. PARKS, Chairman

The industrial heating committee will turn farmer, distributing soil heating literature, make study of soil heating potentialities. It will prepare a sales manual on stereotype furnaces. It will inquire into dairy sterilization laws and enforcement, promote walnut dehydration and develop more complete lists of small heating applications to be sold by utilities and manufacturers.

The power committee will revise its handbook data and add to it salesmanship helps applicable to this particular type of selling. The agricultural power committee will complete its project to make rate studies and help to develop rates more acceptable than present demand type of rates. It will also reprint and circulate booklets, pamphlets and articles to stimulate electrification of farms.

The oil field electrification committee will gather data on competitive power in oil fields, make studies of proper speeds required for distribution line pump operation, so that motors can be designed to meet these conditions rather than attempting to adapt present motors to oil-pumping requirements. It will gather data on temporary service practice with various utilities, seeking to unify practice. Likewise, a comprehensive pipe line map will be prepared.

Lighting Bureau

J. E. HAMMOND, Chairman

In general, the bureau recommended vigorous opposition to shyster lighting and lamp invasion, with the preparation of data on field experience with such racketeering, and further recommended that the P.C.E.B. employ a lighting educational lecturer and counselor to address public meetings and visit the public on behalf of the industry and good lighting.

The street and highway lighting committee will continue to make studies of the relation of traffic accidents to street lighting, will write articles for civic magazines on street lighting needs, and continue highway lighting data gathering.

The commercial lighting committee will complete the preparation of its sales booklet, begun last year, to be used by contractors and salesmen in selling commercial lighting. The educational committee will carry a story to architects on the use of glass in lighting, such as for structural lighting effects or panel lighting. The industrial committee will complete, in cooperation with the P.C.E.B., the industrial Red Seal standard wiring specifications.

The sign and outdoor lighting committee will attempt to coordinate the activities of sign manufacturers and develop cooperative sign campaigns.

The home lighting committee plans to study the market possibilities of home lighting among the three classes of residential customers: (1) the large users, (2) the average users, and (3) the minimum bill users. The most profitable means of approach to these markets will be found. The opinion prevails already from experience that the industry would do better to concentrate its efforts on the first two classes of customers, and seek means to open up these markets. One method which will be developed will be an indirect approach through secondary channels, namely, by the education of the sales staffs of department stores, home furnishings and decorations establishments. Talks will be given on the effect of light upon decorations, dress, colored materials and fabrics. Customer satisfaction, it will be pointed out in these educational lectures, often depends upon use of proper light to see purchased goods as they really are.

▼

Officers and Committee Personnel, 1932-33

GENERAL OFFICERS

R. E. Fisher, P. G. and E. Co., president.
W. C. Mullendore, So. Calif. Ed. Co. Ltd., first vice-president.
A. H. Markwart, P. G. and E. Co., second vice-president.
N. R. Sutherland, P. G. and E. Co., treasurer.
K. I. Dazey, P.C.E.A., managing director.
V. W. Hartley, P.C.E.A., assistant managing director.

EXECUTIVE COMMITTEE

R. M. Alvord, General Electric Co.
G. E. Arbogast, Newbery Electric Co.
H. M. Crawford, P.G. and E. Co.
Addison B. Day, L. A. G. and E. Corp.
F. O. Dolson, So. Sierras Pwr. Co.
D. E. Harris, G. E. Supply Corp.
A. E. Hitchner, Westinghouse E. & M. Co.
F. B. Lewis, So. Calif. Ed. Co. Ltd.
A. F. Morairty, Central Ariz. L. & P. Co.
W. F. Raber, San Diego Cons. G. & E. Co.
G. C. Tenney, Electrical West.
F. C. Weiss, L. A. G. and E. Corp.

ADVERTISING-PUBLICITY SECTION

EXECUTIVE COMMITTEE

Forrest M. Raymond, San Diego Cons. G. & E. Co., chairman.
Richard E. Smith, So. Calif. Ed. Co. Ltd., vice-chairman.
Ella Russell, Coast Counties G. & E. Co., secretary.
Ramsay, E. P., L. A. G. and E. Corp.

STANDARDS COMMITTEE

Wm. A. Cyr, Electrical West, chairman.
Gabbert, J. R., So. Sierras P. Co.
Scott, Dan L., L. A. G. and E. Corp.

INFORMATION COMMITTEE

Richard E. Smith, So. Cal. Ed. Co. Ltd., chairman.

STANDING COMMITTEES

Berry, J. E., Valley Elec. Supply Co.
Cyr, Wm. A., Electrical West.
Dazey, K. I., P. C. E. A.
Freeburg, Alma, Pac. Pub. Service Co.
Frost, A. M., P. G. and E. Co.
Frost, W. L., So. Calif. Ed. Co. Ltd.
Gabbert, J. R., So. Sierras P. Co.
Garrison, Fred, General Electric Co.
Hartley, V. W., P. C. E. B.
Jordan, J. C., P. G. and E. Co.
Joy, A. C., P. G. and E. Co.
Kenyon, R. G., So. Calif. Ed Co. Ltd.
Myrtle, F. S., P. G. and E. Co.
Nillson, Earl, Westinghouse E. & M. Co.
Otterson, J. W., McGraw-Hill Co. of Calif.
Scott, D. L., L. A. G. and E. Corp.
Tenney, G. C., Electrical West.

Round Table Subcommittee

Brunner, C. H., Westinghouse E. & M. Co.
Chapman, P. E., P. G. and E. Co.
Day, W. P., So. Calif. Ed. Co. Ltd.
Delany, C. H., P. G. and E. Co.
Dodds, J., General Electric Co.

Chairmen of P. C. E. A. Sections

J. A. CANNON
Accounting

H. N. CARROLL
Commercial

R. G. BOYLES
Engineering

Ingraham, A. K., P. G. and E. Co.
Jones, F. C., P. G. and E. Co.
Major, R. V., San Diego Cons. G. & E. Co.
Mosher, H. N., P. G. and E. Co.
Munro, N. R., P. G. and E. Co.
Poe, W. C., L. A. G. and E. Corp.
Stillwagon, F. B., P. G. and E. Co.
Thomas, R. J., Hawaiian Elec. Co.
Vail, D. P., C. C. Moore & Co
Valk, E. E., General Electric Co.

ACCOUNTING SECTION

EXECUTIVE COMMITTEE

J. A. Cannon, San Diego Cons. G. & E. Co., chairman.
C. P. Staal, So. Calif. Ed. Co. Ltd., vice-chairman.
Bordwell, J. S., So. Sierras P. Co.
Carpenter, A. B., San Joaquin L. & P. Corp.
Dayton, H. P., Sierra Pacific P. Co.
Hodges, E. W., P. G. and E. Co
McCullough, D. A., Pac. Pub. Service Co.
Moore, O. L., L. A. G. and E. Corp.
Painter, H., Tucson G., E. L. & P. Co.
Reynolds, L. A., P. G. and E. Co
Simmons, E. N., L. A. G and E. Corp.
Terry, H. T., P. G. and E. Co.

CLASSIFICATION OF ACCOUNTS COMMITTEE

A. B. Carpenter, San Joaquin L. & P. Corp., chairman.

CUSTOMERS' BILLING AND RECORDS COMMITTEE

O. L. Moore, L. A. G. and E. Corp., chairman.

FIXED CAPITAL COMMITTEE

Vallery White, So. Calif. Ed. Co. Ltd., chairman.

GENERAL RECORDS COMMITTEE

J. S. Bordwell, So. Sierras P. Co., chairman.

STATISTICS COMMITTEE

W. C. F. West, L. A. G. and E. Corp., chairman.

COMMERCIAL SECTION

EXECUTIVE COMMITTEE

H. N. Carroll, P. G and E. Co., chairman.
R. C. McFadden, So. Calif. Ed. Co., Ltd., vice-chairman.
Bigelow, G. T., So. Sierras P. Co.
Hammond, J. E., San Joaquin L. & P. Corp.
Hixson, M. C., General Electric Co.
Jamison, J. H., Westinghouse E. & M. Co.
Jones, Allen G., General Electric Co.
Morairty, A. F., Cent. Ariz. L. & P. Co.
Nicoll, A. H., Graybar Elec. Co.
Park, W. H., P. G. and E. Co.
Pine, P. P., San Diego Cons. G. & E. Co.
Stahl, E. G., San Joaquin L. & P. Corp.
Vinet, Pierre, Coast Counties G. & E. Co.
Wrenn, J. W., P. G. and E. Co.

GENERAL POWER BUREAU

W. H. Park, P. G. and E. Co., chairman.
G. N. Hawley, So. Calif. Ed. Co. Ltd., vice-chairman.

AGRICULTURAL POWER COMMITTEE

E. G. Stahl, San Joaquin L. & P. Corp., chairman.
Bradford, R. H., Cent. Ariz. L. & P. Co.
Cates, R. H., So. Calif. Ed. Co. Ltd.

INDUSTRIAL LIGHTING COMMITTEE

Tom McDonough, Benjamin E. & M. Co., chairman.
Buckles, Bob, Westinghouse Lamp Co.
Cain, Milo, Coast Counties G. & E. Co.
Linderman, R. G., General Electric Co.
Presbrey, J. O., Ivanhoe Division, Miller Co.
Rankin, G. M., So. Calif. Ed. Co. Ltd.
Russell, Sam, H. B. Squires Co.

STREET AND HIGHWAY LIGHTING COMMITTEE

K. M. Koch, General Electric Co., chairman.
Bear, W. P., P. G. and E. Co.
Dellman, G. H. P., San Diego Cons. G. & E. Co.
Hansen, Frank, Holophane Co.
Hewes, C. E., So. Calif. Ed. Co. Ltd.
Johnson, C. E., Westinghouse E. & M. Co.
Perry, Jack, P. G. and E. Co.
Robinson, W. H., L. A. B. P. & L.
Vinet, Pierre, Coast Counties G. & E. Co.

HOME LIGHTING COMMITTEE

W. E. Carlson, General Electric Co., chairman.
Aue, Geo. F., L. A. G. and E. Corp.
Bevan, Frank, P. G. and E. Co.
Buckby, R. A., General Electric Co.
Deleray, Bert R., Westinghouse Lamp Co.

ADDISON B. DAY
Public Relations

F. M. RAYMOND
Advertising-Publicity

W. J. SCHAEFFER
Transportation

Delehanty, W. J., General Electric Co.
Frost, A. M., P. G. and E. Co.
Moses, Prof. Ben D., University of California.
Pine, P. P., San Diego Cons. G. & E. Co.
Wheelock, D. B., So. Sierras P. Co.
Wood, T. A., P. G. and E. Co.

OIL FIELD ELECTRIFICATION COMMITTEE

H. C. Hill, General Electric Co., chairman.
Fenton, J. H., Westinghouse E. & M. Co.
Kastl, J. P., San Joaquin L. & P. Corp.
Stewart, C. C., So. Calif. Ed. Co. Ltd.

INDUSTRIAL HEATING COMMITTEE

C. J. Cipperly, General Electric Co., chairman.
Bennett, Karl, L. A. G and E. Corp.
Chawner, W. R., So. Sierras P. Co.
Cipperly, Stephen L., So. Calif. Ed. Co. Ltd.
Fogwell, Harry, Thermador Elec. Mfg. Co.
Lee J. Max, J. Max Lee Co.
Owens, C. R., General Electric Co.
Reid, Thomas A., Westinghouse E. & M. Co.
Riggs, Glenn, P. G. & E. Co.
Strauch, Adolph, Wesix Co.
Thompson, L. W., L. W. Thompson Co.
Zelhart, G. E., San Joaquin L. & P. Corp.

LIGHTING BUREAU

J. E. Hammond, San Joaquin L. & P. Corp., chairman.
R. A. Crosby, L. A. G. and E. Corp., vice-chairman.

COMMERCIAL LIGHTING COMMITTEE

R. A. Crosby, L. A. G. and E. Corp., chairman.
Cundiff, Stewart A., So. Sierras P. Co.
Dellman, G. H. P., San Diego Cons. G. & E. Co.
Doerr, O. R., P. G. and E. Co.
Esling, T. A., Curtis Lighting, Inc.
Gianini, Leo G., General Electric Co.
Hansen, Frank, Holophane Co.
Nightingale, F. B., G. E. Supply Corp.
Rankin, George, So. Calif. Ed. Co. Ltd.
Robinson, W. H., Jr., General Electric Co.
Watson, L. M., Westinghouse E. & M. Co.
Wuelker, W. E., Wuelker Reflector Co.

SIGN AND OUTDOOR LIGHTING COMMITTEE

F. B. Nightingale, G. E. Supply Corp., chairman.
Cooley, Frank, Graybar Electric Co.
Handbridge, W. S., P. G. and E. Co.
Martin, Carl O., Benjamin E. & M. Co.
Wellhouse, F. L., Westinghouse E. & M. Co.
White, H. L., Crouse-Hinds Co.

EDUCATIONAL COMMITTEE

Clark Baker, Sr., Baker & Prussia, chairman.
Handbridge, W. S., P. G. and E. Co.
Nightingale, F. B., G. E. Supply Corp.
Rankin, Geo., So. Calif. Ed. Co. Ltd.
Wolf, Carl, Valley Elec. Supply Co.

MERCHANDISING BUREAU

J. W. Wrenn, P. G. and E. Co., chairman.
Paul B. Wilson, San Joaquin L. & P. Corp., vice-chairman.

ELECTRIC WATER HEATING COMMITTEE

E. F. Perkins, P. G. and E. Co., chairman.
Allen, C. E., General Electric Co.
Bragg, R. C., Vallejo Elec. L. & P. Co.
Clifford, O. S., Sierra Pacific P. Co.
Fleming, W., So. Sierras P. Co.
Fogwell, H. H., Thermador Elec. Mfg. Co.
Moon, Frank, L. A. G. and E. Corp.
Mooney, H. V., Wesix, Inc.
Pine, P. P., San Diego Cons. G. & E. Corp.
Rice, H. C., So. Calif. Ed. Co. Ltd.

RANGE COMMITTEE

R. W. Kimberlin, Graybar Electric Co., chairman.
Brundige, L. J., P. G. and E. Co.
Cramm, H. A., L. H. Bennett Co. Ltd.
Dowd, Henry A., Estate Stove Co.
Garbutt, H. L., West. Elec. Supply Co.
Krueger, A. W., G. E. Supply Corp.
Perkins, E. F., P. G. and E. Co.
Smoot, C. C., Standard Elec. Stove Co.
Thomas, Harry M., Chamblin-Thomas Co.
Wilson, P. B., San Joaquin L. & P. Corp.

RADIO COMMITTEE

Roy S. Frothingham, National Broadcasting Co., chairman.

Banta, H. J., Remler Co., Ltd.
Bear, W. P., P. G. and E. Co.
Bennett, L. H., L. H. Bennett Co. Ltd.
Curtis, H. R., H. R. Curtis Co.
Harris, D. E., G. E. Supply Corp.
Laughlin, J. W., Hale Bros. Stores, Inc.
Meyer, Al, Leo J. Meyberg Co.
Smith, R. E., So. Calif. Ed. Co. Ltd.

COMMERCIAL COOKING COMMITTEE

C. T. Kinsman, Dohrmann Hotel Supply Co., chairman.
Huggins, H., General Electric Co.
O'Farrell, Edward, P. G. and E. Co.
Pine, P. P., San Diego Cons. G. and E. Co.
Rice, Henry C., So. Calif. Ed. Co. Ltd.
Welsh, Harry E., So. Calif. Ed. Co. Ltd.
Zelhart, G. E., San Joaquin L. &. P. Corp.

AIR CONDITIONING COMMITTEE

Frank L. Moon, L. A. G. and E. Corp., chairman.
G. E. Zelhart, San Joaquin L. & P. Corp., vice-chairman.
Ansted, Frank B., Modine Mfg. Co.
Babcock, A. Y. K., Cen. Ariz. L. &. P. Co.
Black, W. M., P. G. and E. Co.
Cates, R. H., So. Calif. Ed. Co. Ltd.
Cranston, Wm., Jr., Thermador Elec. Mfg. Co.
DeFremery, D., Union Ice Co.
Douglas, H. H., So. Calif. Ed. Co. Ltd.
Hadfield, F. S., Gay Eng. Corp.
Kilpatrick, H. S., H. S. McClelland Co.
Knox, E. C., Westinghouse E. & M. Co.
Laichinger, J., York Ice Machinery Co.
Lincoln, H. L., Union Ice Co.
Malm, J. C., Calif. Consumers Co.
Mooney, H. V., Wesix Co.
Park, W. H., P. G. and E. Co.
Parks, J. F., Carrier Eng. Corp.
Polderman, L. H., Carrier Eng. Corp.
Porter, D. L., Graybar Elec. Co.
Price, E. D., Ilg Elec. Vent. Co.
Riley, E. S., Frigidaire Corp.
Robbins, Don T., English & Lauer, Inc.
Stoeckley, Chas., General Electric Co.
Thomas, E E., General Electric Co.
Thorp, C. E., L. A. G. and E. Corp.
Wheelock, D. B., So. Sierras P. Co.

AIR HEATING COMMITTEE

G. E. Zelhart, San Joaquin L. & P. Corp., chairman.
C. A. Russell, Wesix, Inc., vice-chairman.
Block, James, South Wesix Heater Co.
Bragg, R. C., Vallejo Elec. L. & P. Co.
Clifford, O. S., Sierra Pacific P. Co.
Cranston, Wm., Jr., Thermador Elec. Mfg. Co.
Douglas, H. H., So. Calif. Ed. Co. Ltd.
Ensinger, P. G. and E. Co.
Fleming, Wm., So. Sierras P. Co.
Perkins, E. F., P. G. and E. Co.
Pine, P. P., San Diego Cons. G. & E. Co.
Robinson, R. S., Edison Elec. App. Co.

APPLIANCE COMMITTEE

R. F. McDonald, West. Elec. Supply Co., chairman.
Althouse, A. W., So. Calif. Ed. Co. Ltd.
Clark, John A., West. Elec. Supply Co.
Frellson, E. M., G. E. Supply Corp.
Jamieson, J. H., West. Elec. Supply Co.
Schuyler, G. B., Apex Rotarex Co.

REFRIGERATION COMMITTEE

R. G. Kenyon, So. Calif. Ed. Co. Ltd., chairman.

JOINT COMMITTEE ON RANGE WIRING PRACTICE

H. H. Courtright, Valley Elec. Supply Co., chairman.

TRANSPORTATION SECTION

EXECUTIVE COMMITTEE

W. J. Schaeffer, L. A. G. and E. Corp., chairman.
H. D. Tisdale, So. Calif. Ed. Co. Ltd., vice-chairman.
A. S. MacDougall, L. A. G. and E. Corp., secretary.
Ducker, P. H., So. Calif. Ed. Co. Ltd.
Mason, D. P., San Joaquin L. &. P. Corp.
Shaw, S. B., P. G. and E. Co.
Stanley, C. R., P. G. and E. Co.
Weiss, C. D., San Diego Cons. G. &. E. Co.
Wood, E. C., P. G. and E. Co.

ORGANIZATION COMMITTEE

E. C. Wood, P. G. and E. Co., chairman.

TECHNICAL COMMITTEE

S. B. Shaw, P. G. and E. Co., chairman.

ACCOUNTING COMMITTEE

H. D. Tisdale, So. Calif. Ed. Co. Ltd., chairman.

SAFETY COMMITTEE

D. P. Mason, San Joaquin L. &. P. Corp., chairman.

VEHICLE COMMITTEE

V. W. Dennis, Pac. Tel. & Tel. Co., chairman.

MAINTENANCE COMMITTEE

C. R. Stanley, P. G. and E. Co., chairman.

BUILDINGS AND POWER TOOLS COMMITTEE

C. D. Weiss, San Diego Cons. G. & E. Co., chairman.

ENGINEERING SECTION

EXECUTIVE COMMITTEE

R. G. Boyles, So. Calif. Ed. Co. Ltd., chairman.
H. K. Fox, San Joaquin L. & P. Corp., vice chairman.
Ayres, K. B., San Diego Cons. G. & E. Co.
Buell, Henry H., P. G. and E. Co.
Buese, L. A., L. A. Gas and E. Corp.
Buswell, J. M., San Joaquin L. & P. Corp.
Carlson, C. B., So. Calif. Ed. Co. Ltd.
Cowles, R. R., P. G. and E. Co.
George, F. R., P. G. and E. Co.
Hagar, G. H., P. G. and E. Co.
Halpenny, R. H., So. Sierras P. Co.
Hinson, N. B., So. Calif. Ed. Co. Ltd.
Hopkins, R. A., Westinghouse E. &. M. Co.
Jones, Allen G., General Electric Co.
Kraps, L. J., So. Calif. Ed. Co. Ltd.
McClung, J. C., L. A. G. and E. Corp.
Moore, L. J., San Joaquin L. &. P. Corp.
Smalley, D. D., Mid. Counties P. S. Corp.

ACCIDENT PREVENTION COMMITTEE

H. B. Wells, L. A. G. and E. Corp., chairman.
Howard Miller, So. Calif. Ed. Co. Ltd., vice-chairman.
Baker, W. R., P. G. and E. Co.
Buese, L. A., L. A. G. and E. Corp.
Hill, Ralph V., P. G. and E. Co.
Hill, Roy V., San Joaquin L. & P. Corp.
Knight, Frank, L. A. G. & E. Corp.
Markey, H. S., P. G. and E. Co.
Searle, George, P. G. and E. Co.

ELECTRICAL APPARATUS COMMITTEE

B. D. Dexter, P. G. and E. Co., chairman.
C. W. White, So. Calif. Ed. Co. Ltd., vice-chairman.

Economics and Application of Automatic Tap Changing Equipment Subcommittee

Affolter, P. H., Garland-Affolter Eng. Corp.
Ayres, Frank., So. Sierras P. Co.
Baugh, C. E., P. G. and E. Co.
Benson, C. R., General Electric Co.
Bidwell, C. D., L. A. G. and E. Corp.
Enefer, J. D., So. Calif. Ed. Co. Ltd.
Garrett, P. B., Westinghouse E. & M. Co.
Glasgow, A. S., San Diego Cons. G. & E. Co.
McCorkle, P. C., San Joaquin L. &. P. Corp.
Searight, F. H., Allis-Chalmers Mfg. Co.
Underwood, T. H., Coast Counties G. & E. Co.

Handling and Treatment of Insulating Oils Subcommittee

Baskette, L., So. Calif. Ed. Co. Ltd.
Kelly, D. J., San Diego Cons. G. & E. Co.
Parker, C. H., So. Sierras P. Co.
Streit, F. H., L. A. G. and E. Corp.
Sutcliffe, H. T., P. G. and E. Co.
Underwood, T. H., Coast Counties G. & E. Co.

New Developments Subcommittee

C. W. White, So. Calif. Ed. Co. Ltd., chairman.
Babcock, G. M., L. A. G. and E. Corp.
Benham, C. F., P. G. and E. Co.
Copley, A. W., Westinghouse E. & M. Co.
Curtis, F., So. Sierras P. Co.
Glasgow, A. S., San Diego Cons. G. & E. Co.
Gustafson, O. A., General Electric Co.
Hopkins, R. A., Westinghouse E. & M. Co.
Ingalls, C. E., Elec. Power Equip. Corp.
Sadler, E. K., Kelman Elec. Mfg. Co.
Schnell, C. E., San Joaquin L. & P. Corp.
Searight, F. H., Allis-Chalmers Co.
Sixtus, E. F., Pac. Elec. Mfg. Corp.
Smith, W. C., General Electric Co.

FOREIGN SYSTEMS COORDINATION COMMITTEE

C. M. Lindsley, So. Sierras Power Co., chairman.
Ashbrook, R. B., So. Calif. Ed. Co. Ltd.
Armstrong, V. D., Sierra Pacific P. Co.
Ayres, A. F., So. Sierras P. Co.
Ayres, K. B., San Diego Cons. G. & E. Co.
Campbell, C. C., P. G. and E. Co.
Cone, D. I., Pac. Tel. & Tel. Co.
Copley, A. W., Westinghouse E. & M. Co.
Corbett, L. J., P. G. and E. Co.
Cowles, R. R., P. G. and E. Co.
Curtiss, G. H., Pac. Radio Trades Assn
Doolittle, F. B., So. Calif. Ed. Co. Ltd.
Dellinger, F. E., L. A. G. and E. Corp.
Fleming, T. J., Calif. Ind. Tel. Assn.
Glasgow, A. S., San Diego Cons. G. & E. Co.
Grimes, W. F., Westinghouse E. & M. Co.
Grunsky, C. E., Pac. Pub. Service Corp.
Gustafson, O. A., General Electric Co.
Hagar, G. H., P. G. and E. Co.
Henry, R. E., So. Calif. Ed. Co. Ltd.
Judson, C. B., Los Angeles G. and E. Corp.
Kalb, H. N., P. G. and E. Co.
Lake, R. E., San Joaquin L. & P. Corp.
Lane, H. S., P. G. and E. Co.
Mess, C. T., Calif. State R. R. Comm.
Northmore, E. R., L. A. G. and E. Corp.
Nott, G. E., So. Calif. Tel. Co.
Porter, E. Y., So. Sierras P. Co.
Rapp, Stanley, Pac. Tel. & Tel. Co.
Sawyer, M. A., So. Calif. Tel. Co.
Schomberg, H. J., So. Sierras P. Co.
Shields, H., San Joaquin L. & P. Corp.
Smith, W. C., General Electric Co.
Stanley, H. C., General Electric Co.
Stauffacher, E. R., So. Cal. Ed. Co. Ltd.
Walters, G. R., Radio Trades Assn. So. Calif.

HYDRAULIC POWER COMMITTEE

H. K. Fox, San Joaquin L. & P. Corp., chairman.
Maryatt, E. F., P. G. and E. Co., vice-chairman.

Current Research and Practice in Hydro-Electric Development Subcommittee

R. D. Likely, San Joaquin L. &. P. Corp., chairman.
Bradley, T. G., Calif. Ore. P. Co.
Brosemer, R. O., General Electric Co.
Cobban, R. J., Westinghouse E. & M. Co.
Corwin, T. J., P. G. and E. Co.
Gaylord, J. C., So. Calif. Ed. Co. Ltd.
Quick, Ray S., Pelton Water Wheel Co.

Economic Phases of Existing Hydro-Electric Plants Subcommittee

J. F. Davenport, So. Calif. Ed. Co. Ltd., chairman.
Brosemer, R. O., General Electric Co.
Carlson, C. B., So. Calif. Ed. Co. Ltd.
Daniels, R. S., Calif. Ore. P. Co.
Holcomb, W. H., Pelton Water Wheel Co.
Lutge, H. V., P. G. and E. Co.
Mueller, R. W., P. G. and E. Co.
Quinn, E. A., San Joaquin L. & P. Corp.
Spaulding, J. N., P. G. and E. Co.
Warren, H. S., Westinghouse E. & M. Co.

Mechanical Reliability of Hydro-Electric Units Subcommittee

D. P. Dinapoli, P. G. and E. Co., chairman.
Brosemer, R. O., General Electric Co.
Cobban, R. J., Westinghouse E. & M. Co.
Gouter, Edwin, So. Calif. Ed. Co. Ltd.
Harp, F. R., San Joaquin L. & P. Corp.
Merritt, B. N., P. G. and E. Co.
Olson, Harry, Calif. Ore. P. Co.
Quick, Ray S., Pelton Water Wheel Co.

UNDERGROUND SYSTEMS COMMITTEE

G. Leslie Hill, P. G. and E. Co., chairman.
J. F. Hodges, So. Calif. Ed. Co. Ltd., vice-chairman.

Subcommittee on Corrosion of Lead, Its Causes and Remedies

B. A. Williamson, L. A. G. and E. Co., chairman.
Corfield, Guy, L. A. G. and E. Co.
Grant, O. R., General Cable Corp.
Lutzi, R. P., P. G. & E. Co.
Pratt, H. M., U. S. Steel Products Co.
Randolph, E. F., So. Calif. Ed. Co. Ltd.
Smith, C. S., P. G. and E. Co.
Stiver, F., P. G. and E. Co.

Subcommittee on Performance of Lead-Covered Cable Under Varying Loads

H. C. Moyer, P. G. and E. Co., chairman.
Hinson, N. B., So. Calif. Ed. Co. Ltd.
Pettit, Z. T., L. A. G. and E. Corp.

Subcommittee on Study of Low Cost Underground Systems

J. F. Hodges, So. Calif. Ed. Co. Ltd., chairman.
Crilly, J. E., General Cable Corp.
Curl, W. C., So. Calif. Ed. Co. Ltd.
Hagar, G. H., P. G. and E. Co.
Melnick, P. F., L. A. G. and E. Corp.
Minor, H. H., San Joaquin L. & P. Corp.
Porter, E. Y., So. Sierras P. Co.
Potts, C. C., Westinghouse E. & M. Co.
Suransky, Paul, P. G. and E. Co.

Subcommittee on Problems in Transformer Vault and Manhole Ventilation

E. R. Stauffacher, So. Calif. Ed. Co. Ltd., chairman.
Bowman, Sam, P. G. and E. Co.

Curl, W. C., So. Calif. Ed. Co. Ltd.
Hagar, G. H., P. G. and E. Co.
Tobey, J. O., P. G. and E. Co.

Subcommittee on Clearing of Faults in Low Voltage Networks

Rothganger, F. G., P. G. and E. Co.

Subcommittee on Trends in the Operation of Network Systems

R. R. Cowles, P. G. and E. Co., chairman.
Delehanty, W. J., General Electric Co.
Garrett, P. B., Westinghouse E. & M. Co.

Subcommittee on Problems of Gaskets for Underground Apparatus

A. W. Flippin, P. G. and E. Co., chairman.
Buell, H. H., P. G. and E. Co.
Ingalls, C. E., G. & W. Mfg. Co.
Pyle, J. C., General Cable Corp.

METER COMMITTEE

F. A. Redding, So. Calif. Ed. Co. Ltd., chairman.
R. Crowell, P. G. and E. Co., vice-chairman.
Abel, J. C., P. G. and E. Co.
Barbera, A. A., Weston Elec. Instr. Corp.
Beardsley, F. D., Coast Counties G. & E. Co.
Blecksmith, A. F., Duncan Elec. Mfg. Co.
Beebe, L. H., So. Calif. Ed. Co. Ltd.
Benson, C. R., General Elec. Co.
Bridges, J. E., Westinghouse E. & M. Co.
Cohn, N., Leeds & Northrup Co.
Collins, G. A., San Joaquin L. & P. Corp.
Conrad, Lester L., So. Calif. Ed. Co. Ltd.
Crowell, R., P. G. and E. Co.
Dorsey, J. H., So. Calif. Ed. Co. Ltd.
Ealson, E., So. Calif. Ed. Co. Ltd.
Frampton, W. R., So. Calif. Ed. Co. Ltd.
Garrison, Fred., General Electric Co.
Gilcrest, C. F., San Joaquin L. & P. Corp.
Grimes, W. F., Westinghouse E. & M. Co.
Holst, Ben C., The Superior S. & D. Co.
Hughes, E. L., P. G. and E. Co.
Irion, A. D., So. Calif. Ed. Co. Ltd.
Jones, R. G., So. Sierras P. Co.
Klose, J. E., P. G. and E. Co.
Knopp, O. A., P. G. and E. Co.
Laner, C. J., L. A. G. and E. Corp.
Linblad, W. N., P. G. and E. Co.
Mason, M. A., L. A. G. and E. Corp.
McMeekin, W. A., L. A. G. and E. Corp.
Plummer, M. A., L. A. G. and E. Corp.
Redding, F. A., So. Calif. Ed. Co. Ltd.
Searle, G. H., P. G. and E. Co.
Seagren, R. C., P. G. and E. Co.
Smalley, D. D., Mid. Counties P. S. Corp.
Southard, J. H., Weston Elec. Instr. Corp.
Talbott, W. H., San Diego Cons. G. & E. Corp.
Thomas, H. M., States Electric Co.

GENERAL COMMITTEE

Ayres, K. B., San Diego Cons. G. & E. Co.
Billica, H. J., Graybar Electric Co.
Borda, I. W., Okonite Cable Co.
Cullen, W. K., P. G. and E. Co.
Hart, E. M., P. G. and E. Co.
Keesling, H. G., P. G. and E. Co.
Kennedy, T. T., Okonite Cable Co.
Madden, J. B., P. G. and E. Co.
Northmore, E. R., L. A. G. and E. Corp.
Ost, P. J., City & County of San Francisco.
Porter, J. C., General Electric Co.
Quinn, E. A., San Joaquin L. & P. Corp.
Riley, G. A., L. A. G. & E. Corp.
Robinson, J. P., Kerite Ins. Cable Co.
Smith, W. C., General Electric Co.

OVERHEAD SYSTEMS COMMITTEE

W. E. Row, So. Calif. Ed. Co. Ltd., chairman.
E. M. Wright, P. G. and E. Co., vice-chairman.

Insulators Subcommittee

C. E. Heath, So. Calif. Ed. Co. Ltd., chairman.
Ayres, K. B., San Diego Cons. G. & E. Co.
Affolter, P. H., Garland-Affolter Co.
Ashbrook, R. B., So. Calif. Ed. Co. Ltd.
Bohnert, A. M., Ohio Brass Co.
Carlsen, N. P., Jr., P. G. and E. Co.
Case, S. L., Westinghouse E. & M. Co.
Condon, E. S., Maydwell & Hartzell
Dellinger, F. E., L. A. G. and E. Corp.
Doolittle, F. B., So. Calif. Ed. Co. Ltd.
Gheen, R. F., Ohio Brass Co.
Halpenny, R. H., So. Sierras P. Co.
Pride, A. W., Westinghouse E. & M. Co.
Shields, H. H., San Joaquin L. & P. Corp.
Smalley, D. D., Mid. Counties P. S. Co.
Thrane, Harold, G. E. Supply Corp.
Wood, R. J. C., So. Calif. Ed. Co. Ltd.

Distribution Economics and Construction Subcommittee

G. A. Riley, L. A. G. and E. Corp., chairman.
Ayres, K. B., San Diego Cons. G. & E. Corp.
Bennett, C. A., So. Calif. Ed. Co. Ltd.
Dellinger, F. E., L. A. G. and E. Corp.
Knopf, H., P. G. and E. Co.
Lindblad, W. N., P. G. and E. Co.
Macdonald, J. E., chairman, Joint Pole Committee.
Macintyre, A. D., P. G. and E. Co.
Porter, E. Y., So. Sierras P. Co.
Porter, J. C., General Electric Co.
Potts, C. C., Westinghouse E. & M. Co.
Schomberg, H. J., So. Sierras P. Co.
Suransky, Paul, P. G. and E. Co.
Walker, C. W., So. Calif. Ed. Co. Ltd.
Wolbert, L. E., P. G. and E. Co.

Lightning Protection of Distribution Lines Subcommittee

H. H. Minor, San Joaquin L. & P. Corp., chairman.
Banks, E. R., San Joaquin L. & P. Corp.
Baugh, C. E., P. G. and E. Co.
Buell, H. H., P. G. and E. Co.
Fitzsimmons, L. J., So. Calif. Ed. Co. Ltd.
Glasgow, A. S., San Diego Cons. G. & E. Co.
Hall, R. V., San Joaquin L. & P. Corp.
Hodges, J. F., So. Calif. Ed. Co. Ltd.
Loper, W. B., So. Sierras P. Co.
Porter, J. C., General Electric Co.
Pride, A. W., Westinghouse E. & M. Co.
Riley, G. A., L. A. G. and E. Corp.
Smith, W. C., General Electric Co.
Stauffacher, E. R., So. Calif. Ed. Co. Ltd.
Taylor, C. P., P. G. and E. Co.

Pole Line Structures Subcommittee

J. B. Madden, P. G. and E. Co., chairman.
Billica, H. J., Graybar Elec. Co.
Bloom, S. S., Calif. R. R. Comm.
Champion, W. P., So. Calif. Ed. Co. Ltd.
Cowles, R. R., P. G. and E. Co.
Gheen, R. F., Ohio Brass Co.
Hagar, G. H., P. G. and E. Co.
Ingalls, C. E., Copperweld Steel Co.
Klippel, F. H., P. G. and E. Co.
Lane, A. M., G. E. Supply Corp.
Long, E. A., Pac. Coast Elec. Co.
Mattson, C. C., L. A. G. and E. Corp.
Mini, J., P. G. and E. Co.
Pratt, H. N., Columbia Steel Co.
Putnam, A. C., So. Sierras P. Co.
Sawyer, M. A., So. Calif. Tel. Co.
Sharp, H. G., Pac. Coast Steel Corp.
Shields, H., San Joaquin L. & P. Corp.
Wayman, J. B., So. Calif. Ed. Co. Ltd.

Rules Subcommittee

L. J. Corbett, P. G. and E. Co., chairman.
Ayres, K. B., San Diego Cons. G. & E. Co.
Cone, D. I., Pac. Tel & Tel. Co.
Flemming, T. J., Associated Tel. Co.
Hodges, J. F., So. Calif. Ed. Co. Ltd.
Lisberger, S. J., P. G. and E. Co.
Minor, H. H., San Joaquin L. & P. Corp.
Northmore, E. R., L. A. G. and E. Corp.
Nott, G. E., So. Calif. Tel. Co.
Porter, E. Y., So. Sierras P. Co.
Smalley, D. D., Mid. Counties P. S. Co.

Stencil Machines for Stores Use Subcommittee

H. E. Cox, So. Calif. Ed. Co. Ltd., chairman.
Fritzer, R. E., San Diego Cons. G. & E. Co.
Kraut, F., P. G. and E. Co.
Lore, C. B., So. Sierras P. Co.

Cost of Stores Operation Subcommittee

R. O. Cross, So. Calif. Ed. Co. Ltd., chairman.
deWaard, Wm., San Diego Cons. G. & E. Co.
Grummett, G. H., San Joaquin L. & P. Co.
Maddock, Wm., L. A. G. and E. Corp.
McCullough, W. J., So. Calif. Ed. Co. Ltd.

Sub Stores Accounting Methods Subcommittee

J. K. Uhler, So. Cal. Ed. Co. Ltd., chairman.
Charronat, A. A., P. G. and E. Co.
Cross, R. O., So. Calif. Ed. Co. Ltd.
Riblet, G. N., and/or
Anderson, J. C., San Diego Cons. G. & E. Co.
McMillan, M. A., L. A. G. and E. Corp.

STANDARDIZATION AND SIMPLIFICATION COMMITTEE

E. A. Long, P. G. and E. Co., chairman.
Bullard, E. A., L. A. G. and E. Corp.
deWaard, Wm., San Diego Cons. G. & E. Co.
Richardson, G. M., So. Calif. Ed. Co. Ltd.
Scott, A. J., So. Sierras P. Co.
Scoville, H. H., P. G. and E. Co.

PRIME MOVERS COMMITTEE

V. F. Estcourt, P. G. and E. Co., chairman.
C. W. Wiggins, San Diego Cons. G. & E. Co., vice-chairman.

Review Subcommittee

C. W. Wiggins, San Diego Cons. G. & E. Co., chairman.
Born, M. R., P. G. and E. Co.
Johnson, V. E., So. Sierras P. Co.
Knight, F. R., L. A. G. and E. Corp.
Kraps, L. J., So. Calif. Ed. Co. Ltd.
Steinbeck, C. E., P. G. and E. Co.

Condensers and Auxiliaries Subcommittees

Major, R. V., San Diego Cons. G. & E. Co.
Mulkey, M. E., P. G. and E. Co.
Spear, R. D., Foster Wheeler Corp.
Williams, S. L., P. G. and E. Co.

Heat Balance, Design and Plant Betterment Subcommittee

J. M. Renfrew, P. G. and E. Co., chairman.
Hicks, L. A., Hawaiian Elec. Co.
Hotchkiss, T. M., So. Calif. Ed. Co. Ltd.
Noble, H. A., San Diego Cons. G. & E. Co.
Powell, R. C., P. G. and E. Co.

Instruments, Automatic Control and Plant Records Subcommittee

J. T. Youd, P. G. and E. Co., chairman.
Bennett, H. C., So. Calif. Ed. Co. Ltd.
Cohn, N., Leeds & Northrup Co.
Markey, H. S., P. G. and E. Co.
Rumble, V. A., Bailey Meter Co.
Shirley, H. T., San Joaquin L. & P. Corp.

Operating and Maintenance Practice Subcommittee

Gordon, G. K., So. Calif. Ed. Co. Ltd.
Meudell, A. Y., San Joaquin L. & P. Corp.
Person, P. A., P. G. and E. Co.
Thomas, R. J., Hawaiian Elec. Co.
Zeise, C. H., L. A. G. and E. Corp.

Plant Management Subcommittee

F. G. Philo, So. Calif. Ed. Co. Ltd., chairman.
Burlingame, L. D., P. G. and E. Co.
Quinn, E. A., San Joaquin L. & P. Corp.

PURCHASING AND STORES SECTION

G. M. Richardson, So. Calif. Ed. Co. Ltd., chairman.
E. P. Hansen, P. G. and E. Co., vice-chairman.

PURCHASING COMMITTEE

E. O. Mahoney, P. G. and E. Co., chairman.

Traffic Subcommittee

L. A. Reid, L. A. G. and E. Corp., chairman.
Henry, F. F., So. Calif. Ed. Co. Ltd.
Swan, Roy, P. G. and E. Co.

New Methods in Purchasing and Stores Subcommittee

H. R. Edwards, P. G. and E. Co., chairman.
Kelley, C. A., So. Sierras P. Co.
Parks, T. B., L. A. G. and E. Corp.
Watkins, E. F., So. Calif. Ed. Co. Ltd.

Use of Trade Acceptances Subcommittee

J. L. Gray, So. Calif. Ed. Co. Ltd., chairman.
Hansen, F. T., P. G. and E. Co.
Hickman, S. E., San Joaquin L. & P. Corp.
Kelley, C. A., So. Sierras P. Co.

STORES COMMITTEE

H. O. McKee, So. Calif. Ed. Co. Ltd., chairman.

Substitution of Materials and Supplies Subcommittee

Frank Palmer, So. Calif. Ed. Co. Ltd., chairman.
deWaard, Wm., San Diego Cons. G. & E. Co.
Lore, C. B., So. Sierras P. Co.
Mason, D. P., San Joaquin L. & P. Corp.
McCullough, W. J., So. Calif. Ed. Co. Ltd.

Methods of Handling Transil Oil Subcommittee

C. C. Castle, So. Calif. Ed. Co. Ltd., chairman.
Charronat, A. A., P. G. and E. Co.
Grummett, G. H., San Joaquin L. & P. Corp.
Maddock, Wm., L. A. G. and E. Corp.

Receiving and Checking Materials Subcommittee

F. A. Westrick, San Diego Cons. G. & E. Co., chairman.
Olsen, Harold, San Diego Cons. G. & E. Co.
Omholt, Knut, So. Calif. Ed. Co. Ltd.
Parry, John, P. G. and E. Co.

STORES ACCOUNTING COMMITTEE

Paul Griffith, So. Calif. Ed. Co. Ltd., chairman.

Subcommittee on Study and Report on Various Methods of Machine Bookkeeping Available and Also Methods Used by Power Companies Throughout Country

A. W. Winkleman, P. G. and E. Co., chairman.
Cox, H. E., So. Calif. Ed. Co. Ltd.
MacKersie, R. E., P. G. and E. Co.
McMillan, M. A., L. A. G. and E. Corp.
Ramage, W. O., San Diego Cons. G. & E. Co.

PUBLIC RELATIONS SECTION

Addison B. Day, L. A. G. and E. Corp., chairman.

CUSTOMERS RELATIONS COMMITTEE

D. L. Scott, L. A. G. and E. Corp., chairman.

EMPLOYEE INFORMATION COMMITTEE

Will H. Fischer, So. Calif. Ed. Co. Ltd., chairman.

PUBLIC SPEAKING COMMITTEE

Al C. Joy, P. G. and E. Co., chairman.

INSURANCE COMMITTEE

W. E. Durfey, San Joaquin L. & P. Corp., chairman.

WOMEN'S COMMITTEE

Mrs. Jeanette I. Rees, So. Calif. Ed. Co. Ltd., chairman.
Clyda Weems, San Joaquin L. & P. Corp., vice-chairman.

Speakers Bureau

Marvel Murray, L. A. G. and E. Corp., chairman.
Clarita Scott Holden, L. A. G. and E. Corp., advisor.

Library Bureau

Mary Caroline Lynn, San Diego Cons. G. & E. Co., chairman.
Ruth E. Creveling, San Diego Cons. G. & E. Co., advisor.

Home Service Bureau

Verda Rarick, So. Calif. Ed. Co. Ltd., chairman.
Jessica Taylor, L. A. G. and E. Corp., advisor.

Safety and First Aid Bureau

Beulah Brown, P. G. and E. Co., chairman.
Ella Russell, Coast Counties G. & E. Co., associate.

Special Committees

Benevolences

Clyda Weems, San Joaquin L. & P. Corp., chairman.
Nyra G. Letchworth, San Joaquin L. & P. Corp., advisor.

Debates and Dramatics

Lillian Broeker, P. G. and E. Co., chairman.
Peggy O'Mahoney, So. Calif. Ed. Co. Ltd., associate.

Publicity

Ella I. Hoeft, So. Calif. Ed. Co. Ltd., chairman.
Agnes Barrell, P. G. and E. Co., associate.

Northwest Association

Northwest Association Committees Chosen

Organization of committees in the Northwest Electric Light & Power Association has dominated association activity in recent weeks. The section organization has been made to parallel the new organization in the N.E.L.A., with four sections named Accounting, Economics, Engineering and Sales, though with some modification of internal committee structure for simplification.

Accounting Section

The Accounting Section, under B. H. Parkinson, Pacific Power & Light Co., chairman, will parallel the organization of the National Section with five committees as follows: budget, A. E. Janssen, Idaho Power Co., chairman; classification of accounts, R. H. Jones, Utah

B. H. PARKINSON

Power & Light Co., chairman; customers' records, C. R. Johnson, Northwestern Electric Co., chairman; general records, R. E. Brennan, Portland General Electric Co., chairman; purchasing and storeroom, R. A. Talbot, Mountain States Power Co., chairman.

A section executive committee meeting was held Nov. 21, in Portland to outline the year's work. O. W. Bennett, Puget Sound Power & Light Co., is vice-chairman of the section and W. F. Miller, The Washington Water Power Co., last year's chairman, is a member-at-large of the executive committee.

Economics Section

W. H. Ude, chairman of the Economics Section, announced the following appointments in his section organization: vice-chairman, C. M. Sanford, Pacific Power & Light Co.; customer

W. H. UDE

ownership committee, D. G. Tyree, The California Oregon Power Co.; insurance committee, L. A. McArthur, Pacific Power & Light Co.; statistics and research committee, G. Gadeholt, Northwestern Electric Co.; and employees' bureau, George T. Bragg, Pacific Power & Light Co. Mr. Bragg will head all the functions of the employees' bureau without formal committee organization, except that of the women employees' committee, which is organized with Marguerite Butler, Portland General Electric Co., as chairman.

Engineering Section

In the Engineering Section, eight instead of the normal ten committees are to be carried. These with their chairmen are as follows: accident prevention, J. B. Fisken, The Washington Water Power Co.; hydraulic power, J. E. Yates, Pacific Power & Light Co.; overhead systems, T. A. Purton, Idaho Power Co.; electrical apparatus, J. Hellenthal, Puget Sound Power & Light Co.; prime movers, O. L. LeFever, Northwestern Electric Co.; underground systems, Paul P. Ashworth, Utah Power & Light Co.; codes and standards, H. H. Schoolfield, Pacific Power & Light Co.; and power systems engineering, G. E. Quinan, Puget Sound Power & Light Co.

The meter committee is to be combined with the electrical apparatus committee, and the foreign systems co-

E. H. COLLINS

ordination committee with the overhead systems committee. E. H. Collins, The Washington Water Power Co., is chairman and W. S. Hill, Grays Harbor Railway & Light Co., is vice-chairman of the section. The executive committee met in Seattle Sept. 23-24 to complete the section organization and lay out plans for the year's work.

Sales Section

With L. W. Brainard, Idaho Power Co., as chairman, and R. B. McElroy, The Washington Water Power Co., vice-chairman, the Sales Section organization is progressing. The industrial and commercial sales bureau is headed by H. S. Atwood, Puget Sound Power & Light Co.; residential sales

L. W. BRAINARD

bureau by R. M. Bleak, Utah Power & Light Co.; and rural sales bureau by D. B. Leonard, Pacific Power & Light Co.

Four committees of the Sales Section will function outside of the three bureaus as follows: advertising, Glenn L. Jackson, The California Oregon Power Co.; dealer relations, L. A. Lewis, The Washington Water Power Co.; wiring, S. B. Clark, Northwestern Electric Co.; and customer service, chairman not yet appointed. M. L. Hibbard, Idaho Power Co., heads the National Cookery Council in the Northwest, while the Regional Director of the Electric Refrigeration Bureau is G. M. Gadsby, Utah Power & Light Co.

The first executive committee meeting of the section was held in Portland, Nov. 21.

Personals

Clark Baker Becomes Bureau Light Counselor

CLARK BAKER, Sr., nicknamed the "Padre of Light" by W. L. Frost some years ago, has been engaged by the Pacific Coast Electrical Bureau as a lighting counselor and lecturer, according to announcement by K. I. Dazey, managing director. Mr. Baker will devote his entire time to educational and promotional work, such as making lectures to business organizations, clubs, sales staffs and other groups. He will work in conjunction with the P.C.E.B. lighting committee, of which

CLARK BAKER

R. A. Alvord is chairman, and the Pacific Coast Electrical Association, Commercial Section, lighting bureau, of which J. E. Hammond is chairman.

In accepting this newly-created position, Mr. Baker has turned over to his partner and business associate, Robert Prussia, all of his interests in "Baker-Prussia, Lightcraftsmen," which Mr. Prussia plans to continue to operate under the original firm name. Both the men formerly were connected with lamp companies, Mr. Prussia with the Westinghouse Lamp Co., and Mr. Baker with the National Lamp Works of General Electric Co., and because of their friendly cooperative lighting promotion work together, decided about a year ago to join forces and establish a new type of lighting sales organization. This organization has steadily progressed and it is this company which Mr. Prussia will continue to operate.

K. I. Dazey announces that Mr. Baker is open for speaking engagements with a choice of several lighting topics, each designed for particular types of audience. For example, there are four talks on home lighting, the first an hour in length, the second 45 minutes, the third 30 minutes, the fourth 45 minutes. The first is designed as an evening lecture to power company employees, women's clubs, interior decorators' groups and school classes in art, home economics or interior decoration. The second is pitched for luncheon or service clubs, P.T.A. groups and ladies' night at lodges or clubs. The third is a shorter talk, using stereopticon only, for similar groups. Lighting demonstrations by means of a special light box are given with the first two types of talks. The fourth talk is on the modernistic trend and its possibilities, and is illustrated with charts. It is designed for art craft classes.

The commercial lighting talks, of which there are three, are prepared, the first for audiences of luncheon clubs, merchants' clubs, department store employees, house furnishings store employees and building owners' associations; the second for building owners or architects and engineers groups; the third for architects, engineers, power company salesmen, building designers. The third lecture is on the use of glass for panel or built-in lighting.

An industrial lighting story has been prepared, taking 30 to 45 minutes, to be given to industrial association groups, shop talk meetings, power company salesmen and wholesalers' salesmen.

For schools and groups interested in stagecraft, a stage lighting story has been prepared, embracing stage craft, lighting and audience psychology. Mr. Baker's own long theatrical experience fits him especially for talks on these subjects.

Bookings for Mr. Baker are to be made through the offices of the P.C.E.B. at San Francisco, Los Angeles or Fresno.

▼

FORREST M. RAYMOND, superintendent of advertising, San Diego Consolidated Gas & Electric Co., has been awarded the annual prize of the Pacific Coast Gas Assn. for the best institutional advertising for 1932.

ADDISON B. DAY, president and general manager of the Los Angeles Gas and Electric Corp., has been elected a member of the board of directors of the Union Bank & Trust Company, Los Angeles.

PUBLIC SERVICE CO. of Colorado elected four additional directors last month: Gaylord B. Buck, general commercial manager; Frank S. Henderson, Boulder manager; C. G. Keeler, Pueblo manager; and Charles Rump, Grand Junction manager.

George Baily, Official Of Westinghouse, Dies

GEORGE BAILY, assistant sales manager and for many years Pacific Coast manager of the Westinghouse merchandising department, died of cerebral hemorrhage on Oct. 29 while attending the Pitt-Notre Dame football game in Pittsburgh.

Mr. Baily was born in Baltimore, attended Lehigh University, graduating in 1904. He was an outstanding athlete in college, starring in football. Following his graduation he came to Pittsburgh and entered the construction business. Later he moved to Cincinnati, where he entered the employ of the Westinghouse Electric & Mfg.

GEORGE BAILY

Co. in its Cincinnati sales office. He remained there until 1917, when he received a commission in the 308th Engineers as major, serving throughout the war.

He rejoined Westinghouse, after the armistice, again in Cincinnati. Later he was sent to Pittsburgh, then to New York. From New York he was transferred to the Pacific Coast. Then he returned East, making his headquarters in Mansfield, Ohio.

▼

Courtright Now Member Of G.E. "Cabinet"

H. H. Courtright, president of Valley Electrical Supply Co., Fresno, Calif., is secretary of health in the cabinet of the president of Refrigerania, that mythical nation of General Electric refrigerator sales outlets. His cabinet portfolio was won by the record of his district in the sale of units during the recent campaign. Approximately $4,500,000 worth of G.E. refrigerators were sold and delivered during the nine weeks of the election drive.

▼

P. H. YELTON, The Southern Sierras Power Co. superintendent at Randsburg, Calif., has been named superintendent of the Victorville office of the company. C. W. Kirkpatrick, salesman at Coachella, succeeds Mr. Yelton at Randsburg.

ORSON M. SLACK, salesman in the Provo office of Utah Power & Light Co., was elected president of the Provo Kiwanis Club early last month.

Contractor Dealer Inspector

Electragists Reduce Dues, Enlarge Membership

At a specially-called meeting on October 27, the San Francisco Electragists reorganized and reduced its dues, thus effecting an increase in membership. The meeting was presided over by Lloyd Flatland, president of both the San Francisco and California Electragists, with the program in charge of Tom Bennett.

The speakers were H. C. Reid, who discussed the California contractors' license law and the necessity for an organization to see that electrical contracting was given attention under provisions of that law; Victor Lemoge, who reported on meeting with the Industrial Association Impartial Wage Board and code and ordinance activities of the organization; W. A. Cyr, who reported on a meeting of the California State Chamber of Commerce Building Congress and its action with respect to the uniform Lien Law, and other matters; C. B. Kenney, who talked on the values of association work; and Clyde Chamblin, former president A.E.I., who spoke on the national association work.

Edward Martin, secretary, presented a new plan for organization by which dues would be reduced to $2 per month, which would cover local and national dues. This would be made possible by the abandonment of the association's office at 604 Mission St., volunteer secretaryship, and a reduced expense budget. An enrollment of 40 members for the reorganized association was made at the meeting on the basis of a one-month trial.

A meeting is planned to present to state association members a similar reduced budget which will cover national dues and such local activities as are possible under the circumstances.

To consider a reorganization of the Northern Chapter, California Electragists, and a reduction in annual dues, a meeting of the chapter has been called by Lloyd Flatland, president, and Edward Martin, secretary, for Dec. 8, at Oakland. The meeting place is to be announced by a committee headed by T. O. Rosenberg, of Oakland.

▼

Denver's New Code Effective in January

Revision of Denver's electrical code has just been completed by a committee drawn from all branches of the local electrical industry. Under the existing ordinance, Denver's city electrician, John Malpiede, is authorized to make such rules and regulations of a technical nature as to insure safe electrical installations. The new working regulations, therefore, will not have to be submitted to the city council, but will become law on endorsement of the municipality's chief building inspector. This endorsement already has been secured from W. T. Hedgcock, Denver's chief building inspector, and the revised code will become effective Jan. 2, 1933.

W. A. J. Guscott, veteran electrical contractor, was chairman of the code revision committee. Arthur L. Abbott, from N.E.M.A. headquarters in New York, rendered valuable assistance to the group, which has been at work for the past six months.

As in the case of a number of other municipalities, Denver has adopted the National Electrical Code with certain modifications and amendments. The all-metal system of wiring, which has been effective in Denver since 1908, will be continued. It likewise appeared advisable to the committee that material changes be adopted in national code sections dealing with motor wiring and fuse protection. A desire to coordinate closely with the national industry in its promotion of uniform adequate wiring standards caused the Denver committee to discard former methods of figuring branch circuit requirements. Instead, it established adequacy standards in Section 807-e which are very similar to those recommended to the Electrical Committee, N.F.P.A., by the International Association of Electrical Inspectors.

Other changes in the Denver code include the following:

(1) Minimum size of service conduits will be one inch, except for installations consisting of a single-branch circuit.

(2) Rigid, metallic-coated conduit or tubing is required for all new installations.

(3) Non-metallic surface extensions will be permitted in accordance with most of the provisions of the new Section 516, which has been proposed for adoption in the 1933 edition of the national code.

(4) Feeder sizes are to be determined by two methods: The first is in accordance with Section 613. In the second method, total number of branch circuits will be used to determine size of feeders; if this method indicates that large copper is required, the city electrician will determine which of the two methods shall apply, or whether a compromise between the two methods shall prevail.

(5) All switchboards must be of the dead front safety type.

(6) Denver's former ruling, which called for No. 12 wire on electric sign installations, has been dropped.

▼

Glendale Passes New Ordinance

A new ordinance, incorporating strong restrictions to what is known as the "floating master" electrician and curbing the maintenance man or jack-of-all-trades, has been passed in the city of Glendale, Calif. It also requires that merchandise offered for sale bear Underwriters' Laboratories approval or listing. It prohibits bidding on work without a license, holds that repair for compensation of any electrical portion of an appliance or material requires contractor's license, exempts sole owners of property from license, requires that master electricians must be members of a contracting firm, requires notarized listing of firm personnel or officers, provides for examination of master electricians and journeymen.

Examination fees set up are $10 for a maintenance man, $2.50 for yearly renewal, and no license fee. For change of employment a new examination is required. Contractor's license is $100, with a $50 renewal and a $500 surety bond. Contractors also are required to pass an examination, for which a fee of $10 is assessed. Exemptions to the ordinance are wiring for gas furnace control of 25 volts or under, manufacture or hanging, but not connection of signs, control wiring for elevators, X-Ray or medical apparatus, and construction coming under jurisdiction of the California Railroad Commission.

The ordinance was sponsored by the Glendale Electrical Contractors and Dealers Association, A. H. Gudie, secretary.

Old-Timer

A YOUNG looking old-timer is P. J. Givnan, electrical contractor and dealer of Seattle, Wash. He started in the electrical business in New York City in 1884 with the old Bentley-Knight Railway Co., which undertook to build an electric railway from Fulton Ferry to Broadway. They worked night and day, but never got current through. Other highlights in his career have been: The Cleveland Electric Company, in New York, winding Gramme ring armatures; in Cleveland, Ohio, with Brush Electric Company; then to the East Cleveland R.R. Company, changing all the field coils at the time when double-ended commutators were in vogue; to the Wagner Company, in St. Louis, where he wound their first motors and got to be foreman; to Seattle to be superintendent of Kilbourne & Clark, radio manufacturers; finally starting in the electrical contracting business.

Manufacturer Distributor

Refrigeration Bureau Sponsors Window Contest

To encourage, through cash prizes and national recognition, both central stations and dealers to put in holiday window displays which sell, the Electric Refrigeration Bureau has announced a national refrigeration window contest. Seven prizes, each of $100, will be awarded, one each for the best dealer window of 100 sq. ft. or less, for the best dealer window of more than 100 sq. ft., for the best dealer store interior display, and three to central stations for similar displays. A grand prize for the best window in both classifications makes the seventh award.

Rules are simple: The display must actually be used sometime in November or December; must feature refrigerators, of any brand or brands; must present the idea of a refrigerator as a Christmas gift; must contain some tie-up with the refrigeration bureau; and a photograph and letter of explanation must be received at the bureau offices, 420 Lexington Ave., New York, not later than Jan. 12, 1933.

▼

Kelvinator Launches Christmas Campaign

Kelvinator Corp., following its successful derby contest of the summer months, has launched a Christmas selling campaign named after the Kelvinator sales manager, Judson Sayre. Key to the campaign is a silver seal, such as is used on Kelvinator refrigerators, attractively boxed for gift purposes where the customer wishes to make the unit a present. Many prizes have been posted for leading sales records in each district.

▼

CLYDE E. ALLEN, supervisor of sales and engineering, Edison General Electric Appliance Corp., Inc., has just had Colorado and western Texas added to his territory, which also includes California, Arizona, Nevada, Utah, New Mexico and the Hawaiian Islands.

CLARENCE R. HUNT, representative of Electrotrim, Inc., has announced the appointment of the following jobbers: Seattle—General Electric Supply Corp., Fobes Supply Co., North Coast Electric Co.; Portland—General Electric Supply Corp.; Spokane—Westinghouse Electric Supply Co.; Tacoma—Home Electric Co.; San Francisco—General Electric Supply Corp., Westinghouse Electric Supply Co. and The Electric Corp.

BRITEWAY ELECTRIC SUPPLY CO. is a newly-opened wholesale electric supply house at 5659 West Adams St., Los Angeles. It is operated by J. H. Mandeville, former appliance salesman, and Arthur Naslund, former electrical contractor.

THE CORNING GLASS WORKS announce the appointment of Galigher Co., Salt Lake City, as Pyrex power insulator representative in Utah, Idaho and the western parts of Montana and Wyoming.

STEWART-WARNER radio now is being distributed in northern California by Incandescent Supply Co., San Francisco.

J. R. JEWETT, for 16 years associated with Arrow Electric Co., in Seattle, is opening offices as an electrical estimator in the McDowall Bldg., Seattle.

THE ROLLER-SMITH Co., New York, has appointed Mark G. Mueller, Denver, as its district sales agent for Colorado, New Mexico and the western part of Kansas.

▼

Westinghouse and Ajax Exchange Patents

Ajax Electrothermic Corp. has licensed Westinghouse Electric & Mfg. Co. to make high frequency or coreless induction furnaces or heaters for certain applications in the field of heating. In return, the Ajax corporation has received a license from Westinghouse to use certain patents of the latter company.

▼

Latest in Lamps

IT'S A FAR CRY from Edison's first successful incandescent lamp to the new 1,000-watt bi-post lamp designed by the Nela Park lamp development laboratory of General Electric Co.

Regarded as the most radical departure from traditional design since Edison's invention, the new bi-post high-wattage lamp dispenses with the customary base and uses instead two copper prongs to which a heat-resisting glass cup is sealed. The new lamps, because of their simpler design and construction, are more rugged than former types, besides being lighter and smaller, and inherently prefocusing.

D. K. Wright, who developed the bi-post lamps, which will be used in the new 19,000 miles of government-lighted airways as well as in motion picture studio work, is shown contrasting one of the new 1,000-watt type with a replica of Edison's first successful incandescent lamp.

Frigidaire Buys Meterice Firm

Purchase of the goodwill and assets of Meterice of America, Ltd., has been announced by Frigidaire Corp., which will use the meters in merchandising Frigidaires in department and furniture stores.

Frigidaire began the sale of its products through department stores on the Meterice plan (EWEST, Nov. 1, 1931, p. 246) more than a year ago, and since then large sums have been spent in jointly advertising the product and plan, making a closer affiliation of the two companies desirable. Changes in organization or personnel, if any are to be made, have not been announced.

▼

SCHLEICHER & CO. Inc., San Francisco, has added three more manufacturers to the list which it represents. General Komtrolar Co., Inc., Dayton, Ohio, has appointed the firm as northern California representative for Telechime electric call systems; it also will represent Belson Mfg. Co., Chicago, makers of theatrical lighting equipment, and Electric Service Supplies Co., also of Chicago, makers of exterior floodlighting projectors, in the six Far Western states. R. W. Schmidt, western sales manager of Electric Service Appliance Co., has been on the Pacific Coast, spending some time with the new representative.

Market Review

California and Intermountain—

THOUGH building construction figures are still retreating over even early season decreases, business optimism is marking time steadfastly, with a firm belief that the opening of 1933 will see many large public projects under way with a consequent thawing out of private capital. Such gigantic undertakings as the Metropolitan Water District of Los Angeles and the two Bay Bridges of the San Francisco area will require such quantities of material and set so many men to work that their influence will be felt in every branch of wholesale and retail trade.

November has been chiefly remarkable for the opening of Metropolitan Water bids (See NEWS).

Industrial orders have shown an encouraging increase, especially in plant additions and renovations, including such orders as $8,000 of G.E. pumping motors and controls for an East Bay manufacturer; a 600-kw. turbo-generator set and accessories, value $14,000, for a San Francisco fertilizer firm; a small Westinghouse crane, value $1,200, for a ship yard; and $2,500 of small motors for a manufacturer of oil burning equipment.

Westinghouse reports several machinery orders for public projects, such as $1,500 of gear equipment for a bridge, a $2,000 turbine set for a lighthouse, $3,500 of distributing transformers for the State of California, and

$9,000 of pumping material for the Hoover Dam.

Power company buying has improved slightly, though such items as pole line hardware are mainly for central stocks and it is significant that very little machinery is being purchased.

Railroad business is still quiescent, even the most necessary maintenance supplies such as some roads buy in quarterly blocks having been cut to new low figures. Contracting business, despite building construction reports, is fairly active with, of course, excessively keen competition. Election results did not produce the immediate and drastic results expected by the more credulous, but brewery additions and reconditioning plus dog-track building are definite items of encouragement, especially the first.

New seasonal models of radios are arriving and are moving well. Washing machines are the best of the major appliances, while automatic toasters and food mixers lead the smaller field.

Seasonal material, such as Christmas decorations, heaters, pads, holloware, and other lines, both personal and for gifts, are showing a fair movement. The long spell of hot weather, has hampered heater resales, though a brief interlude of colder weather produced an instant response which promises well for the season. Holiday shopping will be even later than usual, but shrewd observers forecast that it will surpass either of the last two years. The Wesix Centawatt heater campaign is progressing close to schedule, which provided that November sales would approximately double October's, while December would approximately double November's. On this basis, the factory sales are about on time.

Prices have weakened somewhat during the past month, practically all staple lines, such as conduit, cheaper wiring devices and conduit fittings, having decreased, either through factory or local revision or a combination of both. The buying unit is being constantly whittled.

Despite vigorous following, collections show a disappointing response, though credit men, salesmen and dealers are personally in the field for them a good share of their time. Harvest and crop returns are expected to improve this condition somewhat, but in general it may be said to be parallel to the prevailing spirit of hand-to-mouth buying.

Pacific Northwest—

ELECTRICAL jobbers in Seattle are in receipt of inquiries from not less than 10 breweries in the Puget Sound area for motors, compressors, switchboards, panel boards, refrigeration equipment and the like, and these inquiries, it confidently is believed, will materialize into orders when existing laws have been either modified or repealed by congress. Lumber manufacturing plants, too, following recent increases in price and demands for lumber, are sending out inquiries, and some buying, principally of secondhand motors and equipment, is following. Pulp and paper plants await action on the tariff, barring foreign competition. Central stations, as in the past months, are buying only as needed, the movement to this source involving a few meters, distribution transformers, small orders of poles, etc. There is considerable oil burner and automatic stoker business, motors involved ranging from ⅛ to 2 hp. The effects of the election, as regards building construction in the Northwest, have not been felt except for vague announcements of proposed projects which may proceed after the first of the year. The "better feeling" attitude is gaining strength, permeating all lines of industries.

Leading in sales of electrical apparatus during the month was the order received by the Allis Chalmers Mfg. Co. for approximately $15,000 worth of control apparatus for the government irrigation project at Wapato, Wash. The City of Seattle, through the purchasing department, bought 50,000 ft. of steel guy wire for $17.27 per thousand feet.

▼ ▼ ▼

Barometer

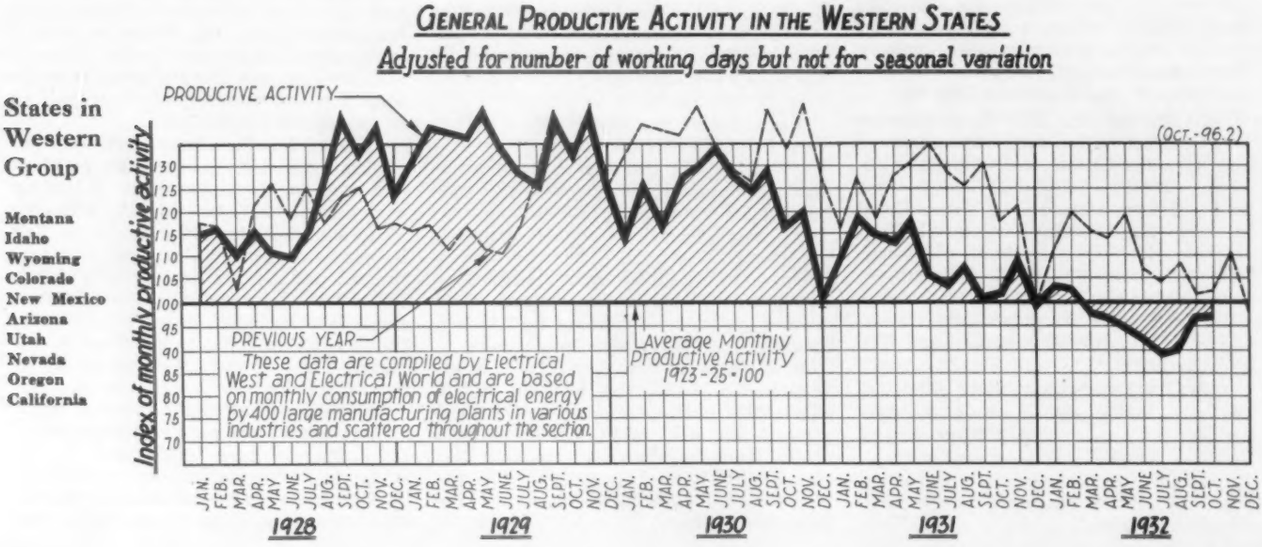
THOUGH very slight, the increase in all industry marks the third rising month. This upward movement is attributable chiefly to an improvement in lumber and paper products, for which the Northwest has been waiting long. Notable decreases were felt in the three industries at the bottom of the table, while the food index receded 6 per cent. The general upturn brings October, 1932, within 6 per cent of October, 1931. The fact that the September general average was revised upward because of the late returns in the food industry, shows that the West is gaining on the figures of a year ago.

Indexes of Manufacturing Activity in the Western States

(All figures adjusted for number of working days)

	Oct., 1932	Sept., 1932	Aug., 1932	Oct., 1931
All industry	96.2	96.0*	89.4	102.2
Chemicals	85.2	84.2	85.3	88.0
Food	113.9	120.0*	113.6	131.8
Metals group	38.2	38.4	35.6	45.2
Forest products	132.8	121.2	104.8	128.1
Paper and pulp	139.5	135.4	126.7	124.3*
Rubber	75.8	84.5	92.8	107.4
Shipbuilding	88.5	108.0	96.5	88.1
Stone, clay and glass	69.3	81.3	82.0	87.3

* Revisions.



New Products

Floodlights

Both constructed of oxidized aluminum, with 9½-in. diameter reflectors, two new Floodlites have been introduced by S & M Lamp Co., Los Angeles. No. 800 has porcelain socket with metal cap, threaded for ½-in. conduit No. 802 (shown) has adjustable bracket, weatherproof cord and plug. Both lights take 100-, 150- or 200-watt lamps. List price, $3.50.—Electrical West, Dec. 1, 1932.

▼

Heating Pads

General Electric's Hotpoint heating device section, Bridgeport, Conn., has developed two new heating pads. The Sanoflex is all rubber, may be immersed in water for sterilizing, may be washed, has thermostatic control. 12 in. long by 8¾ in. wide. Price, $5.95. The Vel-Zip is 12x15 in., velour covered in green, peach or orchid color. When washing is necessary, cover may be removed by zipper fastener. Thermostatic control with three heats. Price, $6—Electrical West, Dec. 1, 1932.

▼

Neon Glow Lamp

Westinghouse Lamp Co., New York, has a Mazda Christmas tree lamp which continues to glow after failure, because a small quantity of neon is present in each lamp. After failure, the full voltage is impressed across lamp terminals, resulting in a characteristic neon glow. Miniature screw base, new flame design bulb.—Electrical West, Dec. 1, 1932.

▼

Hotplates

Five new hotplates have been introduced by Edison General Electric Appliance Co., Inc., Chicago, in single- and twin-unit models. Model D57 is a single-unit hotplate with either 1,200- or 2,100-watt Calrod unit. Model D47 is a twin-unit style with either size Calrod units. Model D31, single-unit style, has white enamel steel top, available with Hi-Speed Calrod, Cast-in-Calrod or open-coil heating unit. Single-unit models are constructed so that banks of hotplates may be placed side by side.—Electrical West, Dec. 1, 1932.

Bridge Table

Something new for card enthusiasts is the latest product of Hammond Clock Co., Chicago; it is an electric card table that shuffles and deals automatically. Simple in operation: A deck is placed in a slot provided at one side, the cards are distributed by an irregularly notched cam to four compartments, one on each side of the table. Two models: Standard, legs and frame of walnut finish, detachable top of masonite with fabricoid covering, $25. DeLuxe, same as Standard except sides are covered with matched veneer. Has two convenience outlets under table, $40.—Electrical West, Dec. 1, 1932.

▼

New Telechrons

Two new Telechrons have been added by Warren Telechron Co.: Consort, shown, a wall model 5¾ in. square, in green, ivory or white; Duke, a table or desk model 4⅜ in. high by 4 in. wide, black plastic with gold-plated base outline and feet. Retail prices are: Consort, $4.75; Duke, $3.95.—Electrical West, Dec. 1, 1932.

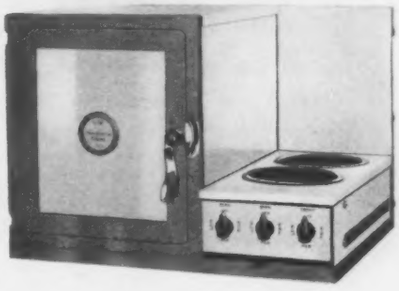
▼

Easy Washer

Easy Washing Machine Corp., Syracuse, N. Y., has announced a new damp-dryer model 3D washer with new features. Dual drainboard swings easily for removing clothes, rinsing tubs, or damp-drying; large rubber wheels; only two controls. Lists in West at $124.50.—Electrical West, Dec. 1, 1932.

Kitchenette Range

Model RA 150 of Edison General Electric Appliance Co., Inc., Chicago, is a Hotpoint kitchenette range, for apartment use, with a connected load of 3,600 watts. Dimensions: 17¾ in. high, 24 9/16 in. wide, 19 9/16 in. deep. Two 1,200-watt Calrod surface units, one 1,200-watt open-coil unit in 12x14x14-in. oven. Automatic temperature control, no time control. Finished in full white porcelain enamel.—Electrical West, Dec. 1, 1932,



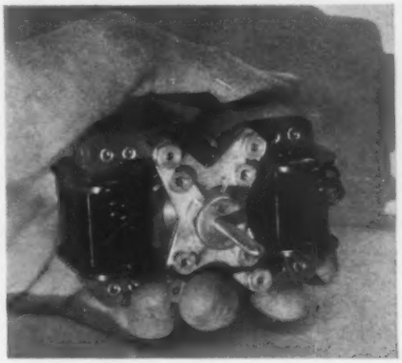
▼

Electric Washer

Little Giant, Inc., Ltd., Oakland, Calif., has announced its Little Giant Washer of tray type, without tub. Clamps on existing trays. Incorporates satin-finished aluminum gyrator. Wringer equipped with balloon rolls and safety release. Durex oilless bearings, aluminum frame, ¼-hp. motor. Bonded service guarantee. Two sizes, priced $79.50 and $99.50.—Electrical West, Dec. 1, 1932.

▼

Shaded-Pole Motor



To supply demand for a shaded-pole electric motor to run at slower speeds than existing models with no sacrifice in starting torque or efficiency, Barber-Colman Co., Rockford, Ill., have announced Type YAK Midget. At full load, motor delivers 0.0035 hp. at 1,300 r.p.m., with an input of 23 watts; starting torque is 0.2 lb.-in. Construction similar to previous models. Outside dimensions: 3x2¼x1 in.—Electrical West, Dec. 1, 1932.

Juice Extractor

Similar to the Junior model, but smaller, the Sunkist Juniorette is a light-weight juice extractor being marketed by California Fruit Growers Exchange, Los Angeles. Finished in ivory enamel with ivory bowl and beetleware reaming bulb. List price, $5.95. The Junior model has been reduced in price to $9.95.—Electrical West, Dec. 1, 1932.

▼

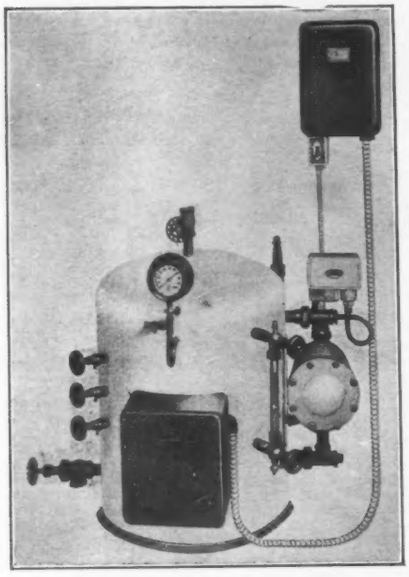
Geared Motors

The Ideal Electric & Mfg. Co., Mansfield, Ohio, now has a gear reduction unit built integrally with its motors. No motor coupling is used as high speed gear is mounted directly on motor shaft. Units available in all gear ratios from 2.09/1 to 376/1, giving output speeds of from 861 to 4.7 r.p.m.; using standard 1,800 r.p.m. motor supplied with these units. All horsepowers from ¾ to 20.—Electrical West, Dec. 1, 1932.

▼

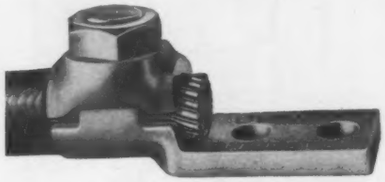
Steam Boiler

Commonwealth Electric & Mfg. Co., Boston, Mass., is marketing a line of electrically-heated full-automatic steam boilers for uses where process steam is required in small amounts at pressures of from 200 lb. downward. Six standard models, 7.5 to 90 kw.; voltages either 110-125 or 220-250. Conforms to A.S.M.E. and Massachusetts codes. Equipment generally competitve with fuels where energy rates are 3c. per kw. or less. Line of miniature steam generators, 1 to 6 kw., also available.—Electrical West, Dec. 1, 1932.



Burndy Lug

Burndy Eng. Co., New York, has produced a clamp-type lug for wires and cables. Instead of soldering the lug on, a wrench is used to tighten a clamp, as shown. Claimed advantages include: closer intimacy with cable, smaller chance of loosening under severe vibration, faster work with less waste—Electrical West, Dec. 1, 1932.



▼

Circuit Breaker

Delta-Star Electric Co., Chicago, is manufacturing a 5-kv., 3,000-amp., 50,000-kva., 3-pole, non-oil throwing type indoor oil circuit breaker with welded square tank. Interior lined with arc-resisting material. Non-magnetic steel parts operate under heavy Everdur domed tank head, eliminating magnetic heating. Terminals and bushings wrapped with impregnated bakelized paper.—Electrical West, Dec. 1, 1932.

▼

Soldering Iron

Hexacon Electric Appliance Co., Roselle Park, N.J., are building an electric soldering iron of adjustable length. Heating elements range from 50 to 500 watts, tip diameters from 7/16 to 1⅝ in. Electric branding irons also announced. Prices of soldering irons range from $3.50 to $13.—Electrical West, Dec. 1, 1932.

▼

G.E. Air Conditioner

General Electric Co., Schenectady, N.Y., has announced its air conditioner, designed to operate in conjunction with the oil furnace for application to warm-air heating systems. Steam from the boiler is supplied to a heat transfer surface in the conditioner to supply heat for air. As it is circulated, air is filtered and humidified.—Electrical West, Dec. 1, 1932.

▼

Magnet Wire

A new enameled insulation has been developed for smaller sizes of magnet wire by the Inca Mfg. Division. Phelps-Dodge Copper Products Corp., Ft. Wayne, Ind., who claim it can be used wherever fabric insulated wire has been applied heretofore up to and including No. 10 gage. Dielectric strength about twice that of standard enameled magnet wire. Can be furnished in colors.—Electrical West, Dec. 1, 1932.

Trade Literature

¶ WELDING—Harnischfeger Corp., Milwaukee, Wis., is distributing a booklet, "Weld It Well," which explains and illustrates, with specifications, the P&H Hansen Arc Welder. Sixteen pages, illustrated.

¶ SURFACE CONDENSERS—Form 9227, issued by Ingersoll-Rand Co., New York, is a 36-page illustrated booklet, in color, on different sizes of its condenser installations, up to 160,000 kw. capacity.

¶ CLOCKS—Warren Telechron Co., Ashland, Mass., has published a catalog leaflet on the entire line of Telechron electric clocks.

¶ OZONATOR—Jefferson Electric Co., Bellwood, Ill., has published a four-page illustrated folder describing the Ozonator which has just been placed on the market; noted in EWEST, Nov. 1, NEW PRODUCTS section.

¶ FLUID METERS—An illustrated 24-page bulletin, No. 300, describing the new line of Bailey fluid meters, is now available from Bailey Meter Co., Cleveland, Ohio. Contains sections on applications, installation methods, diagrammatic sketches, etc.

¶ HARDWARE—"Modern Production of Pole Line Hardware" is the title of a moving picture film produced by Hubbard & Co., Emeryville, Calif., and being shown to utility engineers in the West.

¶ CONNECTORS—Burndy Eng. Co., Inc., New York, has published a supplementary catalog, No. 33A, on the Burndy connectors for wires and cables. Covers the new Burndy clamp-type lug.

¶ FITTINGS—Announced by Appleton Electric Co., Chicago, is a 32-page bulletin, No. 1002, listing and illustrating the line of malleable iron explosion-resisting fittings for hazardous locations.

¶ CHART—Ohmite Mfg. Co., Chicago, announces that it has issued a parallel resistor chart which eliminates calculations arising from use of resistors in parallel.

¶ SIGN FLASHERS—Bulletin No. 10 of Steel City Electric Co., Pittsburgh, lists and describes the electric sign flashers manufactured by the company.

¶ TRASH RAKE—The Leonard trash rack rake, built by S. Morgan Smith Co., York, Pa., is described in bulletin No. 129, issued by that company.

¶ LIGHTING DATA—Benjamin Electric Mfg. Co., Des Plaines, Ill., is distributing additional new lighting data sheets on: (1) Handball Squash Courts; (2) Playground Baseball; and (3) Trap Shooting-Skeet Range.

¶ WORTHINGTON—Worthington Pump and Machinery Corp., Harrison, N. J., has released a number of new catalogs and bulletins:

S-550-S4: gas engines.

W-900-B12: on water disc meters.

W-323-B1: on centrifugal pumps arranged for automatic priming.

D-450-S12: on drainage and irrigation pumps.

D-450-S9, S10 and S11: each on deep well pumps, various sizes.

D-450-S2A: on sump pumps.

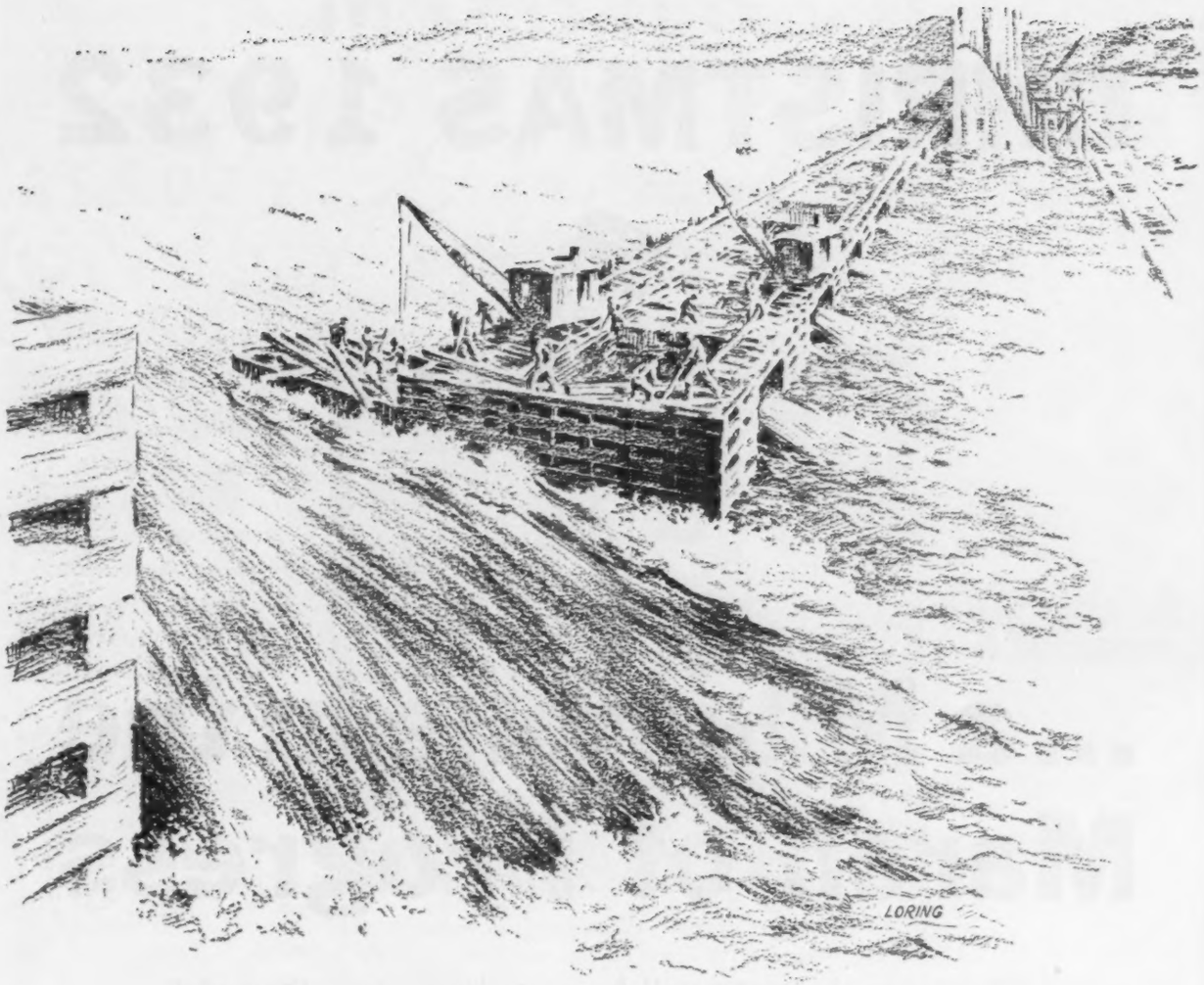
¶ WESTINGHOUSE—Westinghouse Electric & Mfg. Co., Mansfield, Ohio, has issued two new bulletins: 1956, on No-fuze load center; and L.20545, on Type H switchboard instruments.

¶ G.E. RELEASES—General Electric Co., Schenectady, N.Y., is distributing the following new publications:

GEA-77E: G.E. capacitors, Pyranol-treated, 24 pages, illustrated.

GEA-1097A: Novalux highway lighting, 12 pages.

GEA-1661: Metal-clad switchgear, type MI-6, 12 pages.



Skill and Experience

What is called Good Luck in business is the logical outgrowth of careful planning, experience, organization, skill, personnel, progressive thought and action.

It is this kind of planning that enables us to design and build many major hydroelectric and industrial developments—and complete them within the budgeted cost and time.

STONE & WEBSTER
ENGINEERING CORPORATION

A SUBSIDIARY *of* STONE & WEBSTER, INCORPORATED

SAN FRANCISCO
Russ Building

LOS ANGELES
Edison Building

SEATTLE
Skinner Building

CHRISTMAS 1932

...a Milestone in the March of Progress

Christmas this year will be something more than just a beloved holiday. It will be a milestone from which, with programs properly planned, the Electrical Industry will march on to surer ground and more definite accomplishment.

The slate for 1932 is wiped clean. A new year lies just ahead. New set-ups, new opportunities. Now's a time to stop and take stock. A time to look ahead and plan. In the new deal that's due, Electricity will play a bigger part than ever before. Let's get our feet on the ground, take a brace in our belts and be ready.

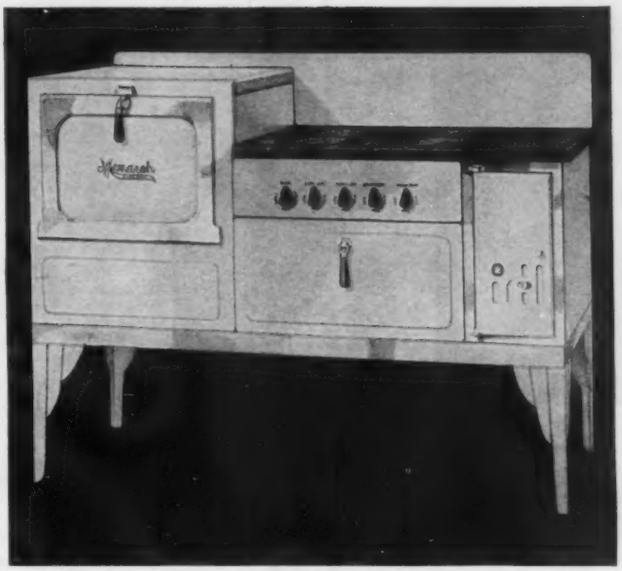
Edison

Southern California Edison Company Ltd.

MONARCH

Ranges that combine COLORFUL BEAUTY... *Important new features and* ATTRACTIVE PRICE

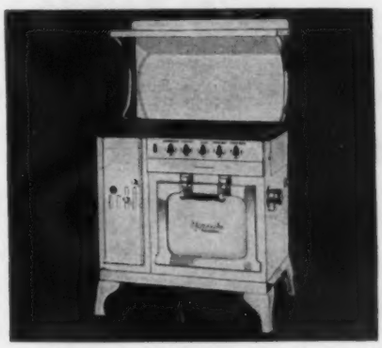
HERE are but three of the many models that make Monarch the most complete electric range line. Send for the catalog showing the full line with new low prices.



Monarch

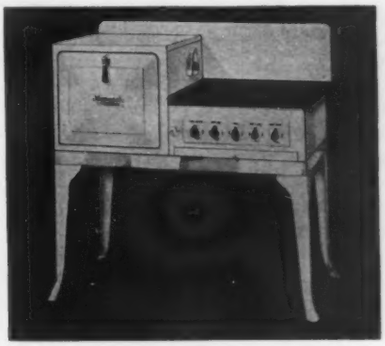
An Outstanding Quality Model with built-in Kitchen Heater at a most attractive price

Model H17F, 17-inch enamel lined oven. 4 surface units. Built-in firebox suitable for coal or wood. Regularly equipped with new type automatic temperature control with illuminated dial which eliminates relay. Roomy utility drawer. Marbleized top of stain-proof porcelain. All porcelain enamel body in choice of white, Nile-Green or Ivory-Tan. Time-control (electric) optional.



A popular seller in the medium price class

Model H37F, with 17-inch oven, aluminum lined. Automatic temperature control standard equipment. Electric timer-clock control optional. Nile, Ivory or white, with rich, green marbleized top of stain-proof porcelain. Built-in coal-wood firebox.



A price leader to be proud of . . .

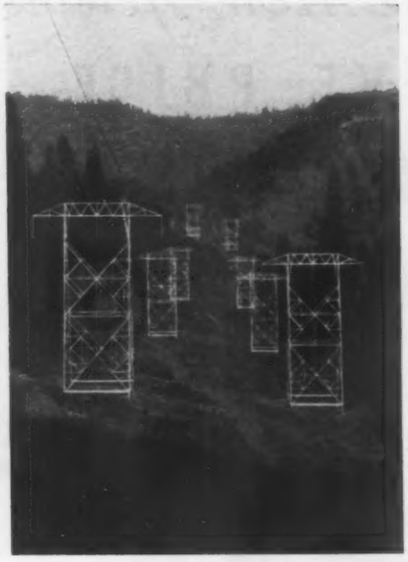
Model 45F, with 15-inch enamel lined oven and new type temperature control having illuminated dial and eliminating relay. Four surface units. All enamel in choice of white or two standard Monarch tints and stain-proof marbleized porcelain top.

MALLEABLE IRON RANGE CO., 3119 LAKE STREET, BEAVER DAM, WIS.

Central Station Representatives: ..... **Chamblin-Thomas Company, 639 Mission Street, San Francisco, California**
Dealer Representative: ..... **Glenn L. Brown, 3515 Kempton Place, Oakland, California**
Northwest Representative: ..... **G. A. Lieser, 1218 17th Avenue North, Seattle, Washington**

STEEL

Transmission Structures



220-kv. Single-Circuit Snow-Type Towers, Mokelumne River Line

Logical

from every viewpoint

From every viewpoint steel is the logical material for transmission structures. Steel offers not only numerous economies but a degree of safety and freedom from the possibility of service interruptions that cannot be obtained with any other material.

Pacific Coast Steel Corporation is fabricating a large and constantly increasing tonnage of steel into transmission structures that are safe, strong, economical. If you are planning a transmission line, our engineers will gladly study all the conditions and recommend supporting structures of the most suitable type.

PACIFIC COAST STEEL CORPORATION

Subsidiary of Bethlehem Steel *Steel Corporation*

General Offices: San Francisco
District Offices: Seattle, Portland, Los Angeles, Honolulu
Export Distributor: Bethlehem Steel Export Corporation
New York

PACIFIC COAST STEEL CORPORATION

Wishing You
a
Merry Christmas
and
Happiness
in the
New Year

JEFFRIES TRANSFORMER CO.
5706 Long Beach Avenue - Los Angeles, Calif.
ELECTRIC AGENCIES, 2059 Webster Street, Oakland

---

39 *years' service*

has proved the superiority of

ORANGEBURG FIBRE CONDUIT

THE thousands of miles of Orangeburg Fibre Conduit in use today vouch for its dependability in protecting underground circuits. Supplied in uniform lengths, it is easy to install, costs little to handle. Stocks carried at the manufacturing plants in Orangeburg, N. Y.; Richmond, Ind., and in all larger cities insure prompt shipments.

The Fibre Conduit Co.
ORANGEBURG, N. Y.

SOLE SELLING AGENT Johns-Manville 292 Madison Ave., N. Y. C.

Actual size of this Advertisement, 4 columns by 15 inches.

ADD A UNIT TO YOUR
Electric kitchen
THIS YEAR MAKE YOUR GIFT a wish come true!
SEE YOUR DEALER ON THIS
P·G·and E·
PACIFIC GAS AND ELECTRIC COMPANY
Owned · Operated · Managed by Californians

Rural Community

APPLIANCE DEALERS...

To Benefit by this Advertisement

TO stimulate dealer sales this Christmas, Pacific Gas and Electric Company is publishing the advertisement reproduced here in all newspapers in towns in which it serves electricity only.

In thousands of rural community homes in Northern California, the buying public will see this dominant Christmas message, "Add a Unit To Your Electric Kitchen," . . . each message with its invitation to visit the dealers' stores. This advertisement is certain to produce worthwhile sales prospects.

The extent to which you will share in this Christmas business depends largely upon the energy you show in going after it. Tie in to this P. G. and E. advertisement with advertising of your own. Let prospective buyers know YOU are the dealer our advertisement advises them to see. Tell them WHERE you can be found. Get your window displays and your floor displays ready now to catch their eyes and open their purses.

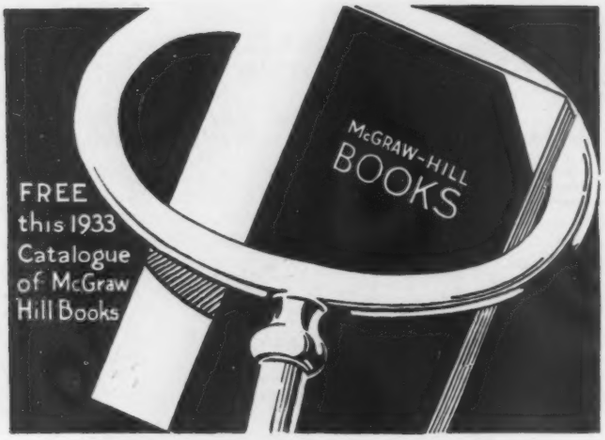
Call your local newspaper offices today and ask when this "all-electric kitchen" advertisement is to be published. They will gladly cooperate with you in preparing an effective tie-in advertisement that will tell prospects that YOUR store is THE place in which to BUY electrical gifts.

P · G · and E ·

EW - 112 - 1232

PACIFIC GAS AND ELECTRIC COMPANY

OWNED . OPERATED . MANAGED BY CALIFORNIANS



More than a Catalogue!

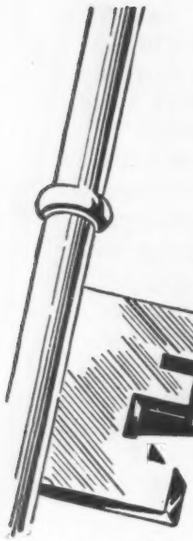
IT'S A KEY to the college for the man who works

Today, many business men face unfamiliar situations . . . new jobs . . . new duties in addition. But, alert and resourceful, they remain undismayed. They call on the aid of experts to help them in studying these problems.

You, too, can command the aid of these experts. Send for this 1933 Catalogue of McGraw-Hill Books. A priceless aid in time of trouble—yet it doesn't cost you a penny!

In its 250 pages, you'll find brief, interesting descriptions of authoritative books on over 2,000 subjects . . . Informing, stimulating books by 1,500 of the leading minds in business, industry and research.

This is no ordinary dry-as-dust Catalogue. It's a bright and shining Key to "The College for the Man Who Works"—a Key used every year by 700,000 wide-awake business men. Can you afford to be without it?



Mail this for FREE CATALOGUE

McGraw-Hill Book Company, O-12-32
330 West 42nd Street,
New York City.

Please send me, free of charge, your 1933 Catalogue of McGraw-Hill Books. I want to know more about: (Name subjects of most interest to you).

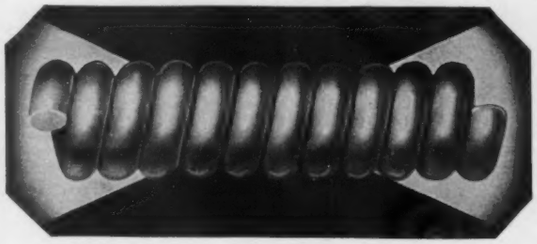
.....

.....

.....

Name.....

Address.....



Galvanized Telephone Wire and Steel Strand

Crapo Galvanized Wire can be wrapped around its own diameter without injury to its pure zinc coating....That is one of a number of reasons why **Crapo** Galvanized Telephone Wire and Strand can be depended upon to reduce maintenance cost.

Look for the **Crapo** Seal!

Indiana Steel & Wire Co.
Muncie, Indiana

INDIANA STEEL & WIRE CO. Crapo Galvanized MUNCIE, IND.

Crapo
GALVANIZED PRODUCTS

Wall Outlets down to a price Mr. Average Man Can Afford!

Lower cost wall outlets have been demanded for years! Now that they are here—what are you doing about it?

ELECTROTRIM

Are you going to take advantage of the tremendous built up demand for lower cost wall outlets? People who never would be even prospects for regular type outlets will BUY Electrotrim! Are you going to sit back and let someone else make more than 35% profit on the material plus BIG installation Profits?

Electrotrim is going over BIG. Already thousands of the leading jobbers and contractor dealers are SELLING it! In addition, many of the largest Public Utilities are actively promoting and selling Electrotrim.

Don't delay ANOTHER Day. Get the full details by returning the coupon NOW.

Electrotrim is the first and ONLY 2-wire non-metallic surface extension material approved by the Underwriters' Laboratories. It is finished in four colors to harmonize with any baseboard, moulding or wall to which it is applied. Protected by 5 basic Patents.

ELECTROTRIM, Inc.
Union City, Ind.

Electrotrim, Inc.
Dept. E-W-12,
Union City, Ind.

Without obligation, rush me full details on Electrotrim and Special Introductory offer.

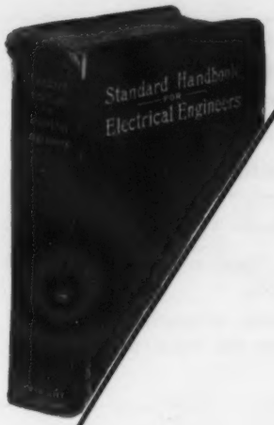
Name .....

Address .....

For Safety's Sake—See Your Electrical Contractor

NOW!

Exchange this –



a double offer— a big saving for you!

Here is an announcement of interest to all electrical engineers. A monumental revision of one of the most important and widely used books in the field—offered at a low introductory price—plus an unusual trade-in value if you are an old user of the book. You know the reputation of this book—read on and learn how you can get the new edition, the first in 10 years, at a cost in tune with the times.

Coming Soon

Revised, Enlarged Sixth Edition

STANDARD HANDBOOK FOR ELECTRICAL ENGINEERS

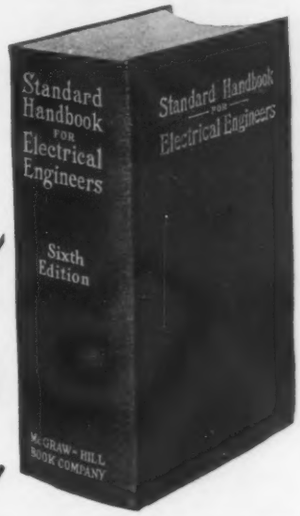
Prepared by a staff of 91 specialists under the editorship of
FRANK F. FOWLE, *Consulting Engineer*
2790 pages, 4½x7, profusely illustrated

1. Special Introductory Price for a limited time only $6.00

Save $1.00, about 15%, by sending your order now, at the introductory price of $6.00. After a limited period the regular price will be $7.00. Because of the great revision and enlargement of this edition, the Handbook is a bargain at the $7.00 price—would be even if the book had been issued as first contemplated, in 2 volumes at $10.00. Consider the value to you of this offer, bringing you the NEW Handbook at $6.00, the same price at which it sold 15 to 20 years ago.

2. An allowance of $1.00 on your old Standard further lowering the price to $5.00

Your old Standard Handbook, doubtless well worn, certainly out-dated in part, is still worth something to you. Therefore this additional concession. Exchange your copy of any edition, no matter what its condition, at a value of $1.00 toward purchase of the new edition. Don't send the old book now. Examine the new edition for 10 days free. At the end of that time, if you want to keep it, send us your old copy and remit only $5.00 in full payment of the new book.



for this!

600 pages larger almost a new book

This revision of the Handbook took four years to complete. So extensive have been developments in electrical engineering since the fifth edition was published 10 years ago, that the new edition has the aspect of an entirely new book. Every section was thoroughly revised and brought up to date; many parts were entirely rewritten. Whole new sections, much new material throughout the book, were added. Many new contributors were called in to make the book dependable and authoritative from every angle. This edition is 600 pages larger than the previous one, and twice as large as the first. At one stroke this book is placed far in front in point of completeness, modernization and usefulness to you.

10 days Free Examination

Just check, sign and mail the coupon now. The 6th edition of the Handbook will be sent to you without cost for 10 days' examination as soon as it is off the press. Then, after you have had an opportunity to look it over, send us the special introductory price of $6.00 (or $5.00 and a copy of an earlier edition of the Handbook), or return the book. But act promptly as this offer is for a limited time only. Be sure to get this saving; send the coupon now.

FREE EXAMINATION COUPON

McGraw-Hill Book Company, Inc.
330 W. 42nd St., New York

Send me the new 6th edition, Standard Handbook for Electrical Engineers, postpaid, for 10 days' free examination. Within 10 days after receipt I will either return the book or:
(check one)

( ) Send you the special introductory price of $6.00.
( ) Send you $5.00 and my copy of an earlier edition of the Standard Handbook.

Name .....

Address .....

City and State .....

Position .....

Company 0.12-32
(Books sent on approval in U.S. and Canada only.)

Send this coupon now

PROFESSIONAL DIRECTORY

BYLLESBY
ENGINEERING & MANAGEMENT CORPORATION
Wholly-owned Subsidiary of Standard Gas and Electric Company
231 South LaSalle Street, Chicago
New York Pittsburgh San Francisco

ARTHUR R. KELLEY
CONSULTING ENGINEER
Reports and Valuations, Public Utility Industrial Properties
Edison Bldg. Los Angeles

ELECTRICAL TESTING LABORATORIES
Electrical Photometrical, Chemical and Mechanical Tests. Inspection of Materials and Apparatus at Manufactory
80th St., and East End Ave., New York

Your card here builds favorable prestige for you. The cost is extremely small. The value is great as a business aid.

THE J. G. WHITE ENGINEERING CORPORATION
Engineers—Contractors
Oil Refineries and Pipe Lines, Steam and Water Power Plants, Transmission Systems, Hotels, Apartments, Office and Industrial Buildings, Railroads.
43 Exchange Place New York

In any line, a specialist does the best job.
Why not consult the firms listed here on your next undertaking?

INDEX TO ADVERTISEMENTS

This index is published as a convenience to the reader. Every care is taken to make it accurate, but ELECTRICAL WEST assumes no responsibility for errors or ommissions.

Electrotrim, Inc. 16
Fibre Conduit Co. 14
General Electric Co., Nela Park 10
General Electric Co., Schenectady 6
Indiana Steel & Wire Co. 16
Jeffries Transformer Co. 14
Johns-Manville Corp. 14
Kearney Corp., James R. 7
Malleable Iron Range Co. 13
McGraw-Hill Book Co., Inc. 16, 17
National Electric Products Corp. ..... Front cover
Neal, Stratford & Kerr 18
Newport News Shipbuilding & Drydock Co., Inside front cover
Pacific Coast Electrical Bureau ..... Back cover
Pacific Coast Steel Corp. 14
Pacific Gas and Electric Co. 15
Professional Directory 18
Sangamo Electric Co. 4, 5
Southern California Edison Co. Ltd. 12
Stone & Webster Engineering Corp. 11
Westinghouse Electric & Mfg. Co. 8, 9
Youngstown Sheet & Tube Co. ..... Inside back cover

Christmas Cards

ARE NOW ON DISPLAY
MORE BEAUTIFUL THAN EVER
AT TODAY'S NEW LOW PRICES

Electrical West is from the press of Neal, Stratford & Kerr

NEAL, STRATFORD & KERR
STATIONERS -:- PRINTERS -:- ENGRAVERS
521 Market St. SAN FRANCISCO 1169 Russ Bldg.

Bound Volumes

FOUR BOUND VOLUMES, containing issues of Electrical West from January 1 to June 1, 1932, inclusive, may be purchased by calling at or writing to the office listed below. These volumes are half-bound in red leather, gold lettered, fully indexed. They are suitable for libraries, either private or company, and may be had for $7.50 each.

ELECTRICAL WEST
883 Mission Street . . . . San Francisco

CLEAN

DEEP-CUT

THREADS

YOUNGSTOWN BUCKEYE CONDUIT

THE YOUNGSTOWN SHEET & TUBE COMPANY

GENERAL OFFICES YOUNGSTOWN, OHIO

Our Rural Electrification Story

told and retold to the farmer—in Bureau announcements

The four advertisements reproduced in miniature on this page are a part of a campaign of twelve announcements appearing in farm publications having a total monthly circulation of nearly 150,000 copies. Other subjects covered were portable electric motors, milking machines, milk refrigeration, dairy sterilization, walnut dehydration, electric brooding, feed grinding, home refrigeration and electric cooking. This schedule of advertisements addressed to rural readers, is the most direct effort yet made in the advertising of your Bureau to educate the farmer on electrical modernization of the farm. It has been prepared and scheduled for publication under the guidance of the Bureau's Rural Electrification Committee as a part of the committee's activities for the current year.

Pacific Coast

ELECTRICAL BUREAU

A non-profit organization supported by all branches of the industry as an advisory bureau to serve impartially all users of electricity

447 Sutter Street, San Francisco

Room M. 15 Edison Bldg. Los Angeles

848 Roosevelt Street Fresno

ELECTRICITY CALIFORNIA

COSTS SO LITTLE IN